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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXI NO. 5

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"WANNA BUY A DUCK?"

Better Crops with PLANT FOOD

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VOL. XXXI WASHINGTON, D. C. MAY 1947 No. 5

Trends in . . .

Teaching

Jeff McDermid

I KNOW a farmer who has worked an 80-acre piece fairly well, milked a small herd of cows night and morning, and besides has done a good job of teaching his own district school for nearly twenty years straight. This unusual fellow claims he didn't want to waste his teacher-college training, and he has always felt that rural schools need more men teachers. He specializes in teaching civic affairs, instructing his older students about the township government field and clear on up to the United Nations set-up. He puts about as much emphasis, too, on the personnel of the town board and the county supervisors as he puts on Marshall, Molotov, and Lie. In addition, he also has a rare way with the beginners' class.

I'm not giving his example as a plea for having more dirt farmers engage in teaching, but rather to indicate that good teachers have a "call" or an urge within themselves which is not easily blighted or discouraged by a limited wage opportunity or an inferior level of classroom equipment. My hunch is that you can't manufacture *a la* the assembly line a set of real high-class teachers, or buy them either. There must be a kind of germ inside somewhere that develops a full-bloom teacher. Naturally we must strengthen our training places for teachers and see that they get fair wages compared with other professions, but to swing the whole proposition on the dollar sign smells a trifle like tripe.

My last day spent in a public school was in June about forty years ago, which might let me off as a spellbinder on schools, but here goes anyhow. The objective of teaching is probably the

same, even if the means and methods are vastly improved since then.

While the work at which I have been plugging ever since they shooed me out of school is generally covered by the term "information" and involves newspaper and magazine expression for the long suffering public, I have never regarded myself as a teacher.

The writer should, like the teacher, know his stuff and be clear and explicit in what he publishes; but unlike the teacher, he has no hands raised in an immediate barrage of anxious inquiry, when certain information has been imparted. The writer can shift his ground, back water, and avoid direct answers in case the dear public is prompted to make further inquiry on some point he has raised.

The teacher must be ready and willing at once to clear up obscurity and misconceptions and satisfy the skeptical and imaginative moods of youthful minds. The writer as a teacher is like the movie actor, who can repeat a "take" in case of error. The real classroom teacher is like the stage performer, who has only one chance to make good before a visible audience. That is why I have never claimed to be a teacher, remembering the best ones we had in those long-past school days, and knowing they surely didn't achieve such standards for the glory or the wealth involved. I like to recall their reign of authority, which helps me more now than it ever did then.

AS AN ASIDE, I might explain that your information man in any government job is a trifle nearer to the teacher in respect to being ready on short notice to review, explain, and digest much of the background springing from current official pronouncements. If you don't think so, be on the receiving end of a phone after a yarn about parity or support prices has been released. Ordinarily, though, the public writer has more time to make adjustments before the public reacts than the classroom instructor enjoys. Hence the good teacher must be soaked in his subject. For you and me to admit our ignorance to a kid is bad enough, but for a schoolma'am it is often fatal.

We who were young and ripe for tutoring away back in the gas-light era had three kinds of teachers—day school, Sunday school, and music. Aside from the more pungent and impressionable sources of facts and warnings derived from schoolmates and parents, the three sets of teachers aforesaid were our mainstay for the practical and cultural arts.

WHEN YOU LOOK back at the time spent with these three kinds of teachers, the ratio stood at approximately forty to one in favor of public school teachers over the other kinds on the hourly basis per week. When you reckon in the time actually spent at desks and blackboard against the waking hours spent with your parents within the home circle during nine months of the year, I suppose the ratio stood about forty to thirty in favor of the school teacher, with Sundays omitted and divided with the Sabbath school class. And as far as I can recall, the deportment of the kids in church school usually cut the teaching effectiveness to a mockery compared with the rigid decorum we had to maintain in day school.

With so much of our early lives spent within the classroom, it is no wonder that I can recall the features and manners of my public school principal and his bevy of subordinate "old maid" teachers almost as well as the ways of my parents.

I am led to believe by a relative who attended a good parochial school that the Sisters who guided young minds in that devout institution were stronger and more forehanded in the household crafts and domestic skills than the supervising boards of our common schools permitted to be taught at the time. Be that as it may, the two forms of public instruction were far ahead

of the original select or private subscription schools which furnished the only means of teaching children outside of the homes less than a century ago in newly settled communities.

The free privilege of sending kids to a common center in charge of a hired preceptor for their basic education was indeed one of the hall-marks of quality in our newly designed democracy. You

got more for your money that way, especially when you were the parents of alert and studious juveniles.

However, it does seem strange as we review it that not a few of the old hardscrabble farmers actually resented the laws about school attendance and considered themselves regimented by compulsory enrollment of their offspring at the fountain of erudition. I have witnessed several scraps and countless bickerings over the parental right to keep his husky youngster in field or furrow while other rural juniors toted dinner pails to the one-room palladium. Maybe we went at it the wrong way—possibly a ban against attendance by small taxpayers might have aroused their zeal for a fair share of the educational dish. But when those grubby old-timers snatched too many gangling kids out of the district school, it made things tougher for the teacher and put overhead costs at wasteful levels.

Looking backward to yearning yesterdays, I recall certain old teachers with as much, or more, reverence as I bear toward some relatives with whom I have lived. At the time of my tutelage under their sovereign sway there were brief moments when I hated them, but many of those of whom I stood in dread have long since become my ideal as forthright "mental governors."

When I consult the dingy records of the school board for those departed terms, and note the fact that the best of my former teachers received hardly more than the janitor and had to pay their own expenses to teachers' institutes or lose their jobs—I then wonder if they are getting some bonus or permanent halo or a special set of marcelled wings up in that corner of the Promised Land where now they teach the cherubim.

I remember a young teacher who came a long way to join our staff and whom I found weeping in her study nook over some routine failure; another one who cared for a bedridden mother and spent many donated evenings coaching classes in rhetoric or debate; and another who was lame and homely, but who had such strong personality that her desk was always heaped with seasonal wild flowers; and of course, the principal, who seemed haughty and aloof, but who was the first stranger to enter my home at the last illness of my mother.

BEFORE I REACHED high-school age it was our custom to haunt the halls and watch the upper-class teachers wend their sedate way to the top altar of learning. There was one gaunt and firm-lipped spinster who cast her shadows before my scholastic path, and we all dreaded the fall when it would be our turn to master mathematics at her beck and call. I was never so deceived in my life, and no single teacher I ever had remains so firmly and warmly sheltered in my memory. She was an elder statesman and a philosopher combined, a grand teacher and a believer in outdoor sports and social recreation. Sometimes the youthful mind sadly misjudges, but lives to learn and long remember.

I dare say no Sunday-school class period or any single Sabbath instructor of mine has ever left me with a cleaner and more wholesome outlook than this

(*Turn to page* 50)

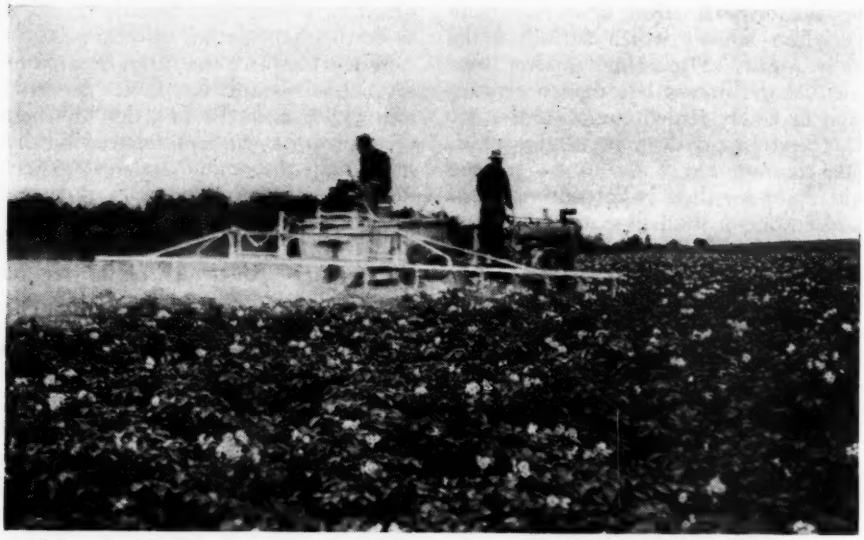

Fig. 1. The right sprays applied at the right time are very important in realizing maximum profit in potato production.

Potato-Growing Developments In New England

By Ford S. Prince

Department of Agronomy, University of New Hampshire, Durham, New Hampshire

POTATO growers in 1946 witnessed the effect of a combination of favorable circumstances on potato yields. A cooler than average growing season, plenty of rain during August when the tubers were making their most growth, coupled with the wide-spread use of DDT conspired to produce the most potatoes the United States has ever grown on the smallest acreage planted since 1892.

Actually, the acre yield of potatoes in the country was 29 bushels higher than in 1945, the previous record year. Acre yields of individual growers reached almost fantastic records. More men produced over 500 bushels per acre in the New Hampshire 300-Bushel Club than in the previous 20 years of the Club's history. The State record of 535 bushels which had stood since 1941 and was held by John Jackson and Son of Colebrook was exceeded by 152 bushels per acre by John York of Kingston, whose yield was 687 bushels per acre on a three-acre tract.

How much of these large yields can be credited to DDT and how much to the effect of favorable weather can only be conjectured. Nor can we predict the weather in 1947 or any future year. But we feel fairly certain of a continued and adequate supply of DDT which has proved to be a most satisfactory

control for flea beetles, leaf hoppers, and a fair control for aphids. It may be that in the very near future, spray and dust equipment will be modified so that better aphid control with DDT will be possible, or it is very likely that other new products will be developed that will show a better killing power for aphids than DDT now possesses.

Most growers realize this year, for the first time, what the control of these small insects means in relation to yields. Many of them would not have believed, probably, that such control would increase yields by 50, 75, or even 100 bushels of potatoes per acre. Yet, it is apparently possible. We predicted a dozen years ago that no one in New Hampshire would produce as many as 600 bushels of potatoes per acre until he could control these little pests which do so much damage in July and August when the tubers are forming. In 1946 for the first time potato leaves were not punched full of shot holes by flea beetles in August. It was the first year, too, in which a lot of hopper burn was not noticeable. This allowed the big, broad, uninjured leaves to do their full work in assimilating food materials, producing abundant tuber growth.

With these facts in mind, it may be well for potato growers to re-examine their whole potato program, including their rotations, their soil fertility schedule, the possibility of the need for some of the rare or minor elements on their land, the question of variety and the quality of the potatoes they produce, with the view of adjusting acreage and production to consumer demands and supplying a high quality product to consumers who are likely to be more and more discriminating.

Organic Matter

There has been a tendency for the acreage of potatoes to become concentrated on farms with larger units. Oftentimes, these growers produce nothing else to sell. The tendency on these farms has been to crop the land to potatoes more than one year, and frequently for 5, 8, or 10 years in succession. We have instances in New Hampshire in which potatoes have been grown on the same land more than 20 years in succession. Constant cropping like this tends to deplete soil organic matter and leads to serious erosion, especially on the hill farms.

Working with the rotation problem in New Hampshire,[1] we have found that even in a three-year rotation of potatoes, oats, and clover, there was a loss of organic matter due to cultivation. In these rotations, the oats and first clover crop were removed, while

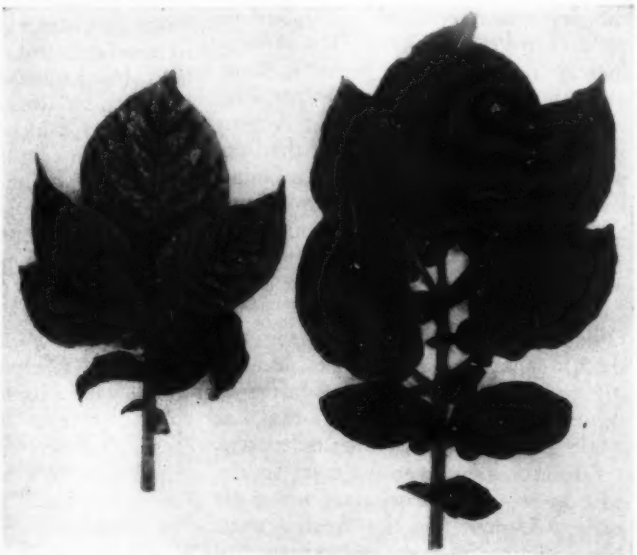

Fig. 2. Potash deficiency (left) is indicated by a yellowish to blackish brown coloration of potato leaf margins and the tips of leaves are curled downward. Internodes are shortened giving the plant a compact or crowded appearance. A normal leaf is shown at right.

the second clover crop was plowed under. Applications of lime tended to decrease the loss in organic matter as did fertilizers containing a high phosphorus content. This fact is doubtless due to the stimulating effect of calcium and phosphorus on root growth. According to the available data, it would take a rotation of four or five years duration with only one year in potatoes to maintain the organic matter of the soil at its original level.

Green manuring is a possibility for reducing organic matter losses in potato rotations. This is another matter under study in our State.[2] Beginning with 1940, potatoes have been grown on a Paxton soil, on small plots, to study the effects of different cropping systems on soil erosion. One series of plots has had a rye cover seeded each fall, while on the other series, no cover crop has been grown. In 1940, yields were the same whereas in 1941, a drought year, the plots on which rye had been turned under suffered from lack of moisture and failed to yield quite as many potatoes as the plots which had no cover. Since 1941, the rye plots have outyielded the bare plots from 4 bushels in the dry season of 1944 to 30 bushels per acre in 1945 and 1946. The average increase for the six-year period in favor of rye is 14 bushels of potatoes per acre.

Studies[3] on early blight last August indicated that the potatoes on the bare plots had 13.8 lesions per compound leaf while those on the rye plots showed but 3.7. This condition, of course, resulted in the earlier death of the vines on the bare plots, which no doubt accounts for the lowered yields there. Other studies conducted last summer tend to substantiate these data, indicating more early blight on potatoes in those rotations in which no attempt is made to maintain soil organic matter.

Growers have been puzzled in the past as to why potato vines often die early. Depredation by small insects has undoubtedly been one cause. But a second and very potent one probably has been lack of soil organic matter. This, then, is undoubtedly a good time for growers to overhaul their rotations and cropping practices in order to get some fresh organic matter into their soils. This may mean reduction in acreage or merely placing more emphasis upon winter cover crops. In either case, better crops in the future will result on the acreage planted.

Fertilizers

Potato growers can be said to be very conscious of plant food and the necessity for applying commercial fertilizers for the crop. Our 300-Bushel Club records show a constant and steady advance in the amount of plant food applied from about 1,900 pounds per acre 20 years ago to 3,000 pounds in 1946. These figures are calculated to a 20-unit basis. In other words, the actual amount of fertilizer applied per acre by these growers in 1946 was about 2,400 pounds of a 5-10-10 grade, which is a 25-unit fertilizer. Individual growers in this group applied as much as 3,500 to 4,000 pounds of 20-unit fertilizer.

These amounts of fertilizer, which have likely been duplicated in all the New England States, are far above the recommendations issued by agronomists and horticulturists during and since the war for use on the potato crop.

Putting aside the recommendations and looking at the experimental data, Brown,[4] in Connecticut, states that 100 pounds of nitrogen per acre for potatoes are sufficient under practically all conditions, 80 pounds are ample in many cases, and 60 pounds or even less will suffice when potatoes follow a sod crop. This worker states that seldom do potatoes respond to more than 160 pounds of phosphoric acid and that 120 pounds or even less will give optimum results under continuous culture or short rotations. He also states that in most cases, 120 pounds of potash will be adequate.

Chucka, Hawkins, and Brown[5] suggest that potato fertilizers in Aroostook County should supply, per acre, ap-

Fig. 3. Influence of manuring on the shape of potato tubers. Left: Round tubers resulted when fertilizers high in potash were used. Right: Tubers long and tapering at the crown end resulted when fertilizers high in nitrogen and low in potash were used.

proximately 100 pounds each of nitrogen and phosphoric acid and about 200 pounds of potash.

In our work in New Hampshire,[6] we have not found a need for more than 100 pounds of nitrogen per acre, although our studies indicate that in long rotations and particularly at high elevations on soils in the podzol group, we do get a response for more than 160 pounds each of phosphoric acid and potash. On soils such as these we recommend a fertilizer approximating one ton of 4-12-12 per acre which would carry 80 pounds of nitrogen and 240 pounds each of phosphoric acid and potash. If potatoes were grown a second and third year on this land, the formula could be narrowed to a 1-2-2 ratio, no doubt, because of accumulations of phosphoric acid and potash not used by the preceding crops.

Several workers have reported results of fertilizing potatoes with different amounts of fertilizer. Two of these are summarized in table 1.

Both these studies show that so far as yields are concerned, the upper limit of yields was not reached even with one and one-half tons of fertilizer, but that the rate of return per hundredweight of fertilizer declined steadily as larger amounts were applied. Obviously, when the number of bushels of potatoes produced with an extra hundred pounds of fertilizer fails to pay for the fertilizer, the limit of economy has been reached and, in fact, passed. Where this point is will always be determined by fertilizer costs and potato prices. Certain it is that the most profitable fertilizer use is somewhere in the lower rather than in the upper levels. With guaranteed potato prices and since fertilizer costs have not risen in proportion to other commodities, there hasn't been

TABLE 1—THE RESULTS OF VARYING RATES OF FERTILIZER APPLICATION ON POTATOES

Maine Results[5]

Fertilizer treatment		Yields per A., bushels	Gain, bushels	Gain in bushels per cwt. of fertilizer
None		117		
500	4–8–7	251	134	26.8
1,000	4–8–7	326	75	15.0
1,500	4–8–7	374	48	9.6
2,000	4–8–7	406	32	6.4
3,000	4–8–7	425	19	1.9

New Hampshire Results[6]

1,000	4–8–7	318		
2,000	4–8–7	386	68	6.8
3,000	4–8–7	431	45	4.5

too much need for worry. But this time will soon pass, undoubtedly. For this reason, it may be well for potato growers to be thinking about the economy of their fertilizer procedure.

That there is an accumulation of plant food in potato soils, particularly of phosphoric acid and potash, has been shown by a number of investigators. Peech[7] and his associates working on the potato-growing soils of different states have recently emphasized this fact. Their studies on accumulations of plant food are now being supplemented by field tests of producing potatoes with different levels of phosphoric acid and potash in the fertilizer on soils with known levels of available soil phosphoric acid and potash.[8] The response in yield for added amounts of both elements declined as their respective levels in the soil increased.

The point is, here is a group of growers who have, by excessive fertilization, put considerably more plant food into their soils than has been removed by the crops they grew. That this has resulted in high yields there is no question. There is no question either that by doing this they have built up a reserve of plant food in their soils, which tends to limit the response they secure from further application of huge amounts of fertilizer. With changing economic conditions, here is one factor the grower can take into consideration. He can retrench somewhat in his fertilizer costs, at the same time cropping-out his phosphate and potash reserves which have been built up during the time he could afford to purchase the excess fertilizer.

Rare Elements

There is another fact which is beginning to dawn upon us and that is the need for some of the minor elements in the nutrition of the potato plant. This need doubtless has been magnified by the production of large crops of potatoes through heavy fertilization, a fact which has tended to reduce the supply in the soil of some of the so-called minor elements that are not contained in a normal fertilizer.

The evidence for the need to apply magnesium in potato fertilizers is probably better established than that of any of the other so-called trace elements. This element deficiency was first worked out in Maine by Chucka and Brown,[9] who found that the trouble could be corrected by applying available magnesium in the fertilizer or by using dolomitic limestone directly on the land.

Magnesium hunger in potatoes, when it occurs, is evidenced by a chlorotic condition of the lower leaves, which causes them to turn rusty brown or bronze in color. When it occurs, unless corrected, magnesium hunger may cause a loss in yield of from 25 to 75 bushels per acre. The trouble may have shown up in Aroostook County sooner because of intensive cropping, under heavy fertilization, in a system of farming in which no livestock is kept.

In New Hampshire, our growers have encountered magnesium hunger chiefly on intensive potato land. We have observed few cases of the trouble on dairy farms where manure is used in the rotation. Since there has been a tendency for potato growing to become concentrated on a few farms with large acreages rather than on many farms with small acreages, it is doubtless advisable to take precautions and apply magnesium in the fertilizer or use a magnesium-bearing limestone when liming is practiced. Fear of causing potato scab by using lime has tended to deplete soil magnesium more rapidly than where a sensible liming program was followed.

Boron is another nutrient element that deserves more study in connection with the potato crop. Dunklee and Midgley[10] in Vermont report that potatoes respond to boron by having more resistance to early blight and better quality in the tubers. Hawkins, Chucka, and Brown[11] reported in 1941

(*Turn to page* 41)

Fig. 1. Corn demonstration by Jimmie Kirk, Iuka, Miss., produced a yield of 112 bu. with complete fertilizer, 80 bu. with nitrogen only, and 40 bu. with no fertilizer.

Increasing Grain Production In Mississippi

By J. M. Weeks

Extension Agronomist, State College, Mississippi

HOW MUCH longer will Mississippi and other southeastern states continue to be deficit feed-producing areas, especially when livestock numbers are being increased so rapidly? What can be done about it, and how soon can we expect improvement in production of feed, particularly grain?

For the period 1935-44, an average of 2.9 million harvested acres of corn yielded an annual average of 44.5 million bushels. The yield per acre was 15.3 bushels, about the average during the past 15 to 20 years. The trend in acreage of corn is steadily downward, 2.4 million in 1945 and 2.2 million in 1946. Exceptional growing conditions in 1945 produced a record yield of 20 bushels per acre and a total of 48.5 million bushels. But, the yield dropped again in 1946 to 16.5 bushels and a crop of only 36.4 million bushels of corn.

The picture with respect to oats looks much better, but not yet good enough. The 1934-44 average harvested acreage was 194,000; yield per acre, 30.5 bushels; and a crop of 6.3 million bushels. The acreage has increased rapidly each year since except in 1946, which was due to extremely adverse weather conditions at planting and harvesting periods. The 480,000 acres in 1945 yielded 31 bushels per acre and a total crop of 14.9 million bushels. The 1946 crop on 360,000 acres produced 31 bushels per acre and a total of 11.1 million bushels of oats. It is estimated that about 500,000 acres were planted during the fall of 1946, another record.

These figures all add up to the fact that about a half million fewer acres of grain were harvested in 1946; and about 5.5 million fewer bushels of corn-equivalent grain were produced than

10 years ago. This is a net loss of feed grain, while livestock numbers in the State have increased about 16 per cent. Shortage of cottonseed meal and other concentrates blackens the picture still more.

Ten years ago, an average of about one million tons of hay was harvested from 892,000 acres, a yield of 1.16 tons per acre. The yield has increased to 1.38 tons per acre in 1946 to produce 1.2 million tons on 854,000 acres. This increased hay has not substituted for very much grain.

Improved pastures and grazing crops have lessened to some extent the need for grain feeds. Less than a half-million acres of improved pasture could be accounted for 10 years ago, while 1.5 million acres are now reported. The increase will be much more rapid each year.

After allowing due credit for increased production of small grain, hay, and grazing, the feed situation in Mississippi for present livestock needs is just about status quo, compared with the relative situation that existed 10 years ago. The problem in grain production is largely a simple one of yields per acre, and little has been done by most farmers to increase the yields of corn and oats.

Fig. 2. Dixie 11 hybrid corn yields 15 to 20 per cent more than best open-pollinated varieties.

Corn has been the "stepchild" among the crops in its treatment compared with the cash crop cotton. Probably 90 per cent of the cotton acreage receives reasonably high rates of recommended fertilizer, while not more than 10 per cent of the corn receives any fertilizer at all. This difference in treatment cannot be justified on a basis of difference in returns from a dollar spent for fertilizer for the two crops.

Corn experiments in Mississippi for more than 20 years have shown that nitrogen, in all sections of the State, returns $4 to $5 worth of corn for each dollar spent for fertilizer used on it. This is the same rate of returns as received from fertilizer used on cotton.

The yield of corn could be increased from the 15-bushel average to 25 bushels if each acre were fertilized with 24 to 32 pounds of nitrogen. A 10-bushel increase in the yield on the 2.2 million acres of corn harvested in 1946 would have added 22 million bushels to the 36.4 million bushels harvested. This would have given a record corn crop of 58.4 million bushels. Similar practice for oats would have increased the 31-bushel average yield to at least 45 bushels. This would have added about 5 million to the 11.1 million bushels harvested to make a total crop of 16.1 million bushels. All of this corn and oats should satisfy the grain requirements of the live stock in the State.

While 24 to 32 pounds of nitrogen per acre are generally recommended, very poor hill soils need phosphorus and potash also for growing high yields of corn. Tests and demonstrations are pointing out possibilities of corn production through a balanced fertilizer program.

Special corn-production demonstrations were conducted in Mississippi in

1945 and 1946 with 4-H club boys and adult farmers. The American Potash Institute sponsors the 4-H corn production contest in cooperation with the Mississippi Extension Agronomy Department and county and assistant county agents. A total of 109 4-H boys conducted corn demonstrations in 1945. Complete records were sent in on the 23 demonstrations having the highest yields, for the awards offered in the contest. Eight widely scattered counties were represented. In 1946, 855 demonstrations were conducted by 4-H boys and adults in 62 of the 82 counties, and complete records were sent in on 32 demonstrations for competition for awards.

Fertilizer requirements in the demonstrations follow:

Plot	Treatment	Rate per acre
1	6–8–8 fertilizer or 6–8–4 fertilizer	500 lbs. (applied in water furrow before bedding rows for planting)
	Additional nitrogen	32 lbs. nitrogen side-dressed when corn is about knee-high
2	Nitrogen only	32 lbs. nitrogen in water furrow
	Additional nitrogen	32 lbs. side-dressed
3	Check—no fertilizer used	

Fertilizer in plots 1 and 2 was applied in the water furrow before the land was bedded for planting. These plots also received a side-dressing of 32 pounds of additional nitrogen when the corn was about knee-high.

Corn yields were estimated in the field according to a standard method. The location, general fertilizer treatment, and yields per acre reported in 1946 with average figures compared with demonstrations in 1945 are shown in table 1.

The average yield of the check plots, without fertilizer, was 34 bushels per acre. Average yield on No. 2 plots, receiving 64 pounds of nitrogen per acre, was 61 bushels, or 27 bushels more than the corn which was not fertilized.

Plots No. 1, which received the same amount of nitrogen as plots No. 2, and also phosphorus and potash, averaged 77 bushels. This yield was an increase of 16 bushels per acre which can be credited to the phosphorus and potash, and 43 bushels more than yields on the check plots. Only four demonstration records out of the 32 reports showed negative results from use of complete fertilizer. Returns from nitrogen only were generally in line with yields obtained by the State Experiment Station, approximately one bushel of corn for each two pounds of nitrogen used.

Research and demonstrations also show that maximum yields from fertilizer are obtained by growing many more stalks of corn on an acre than farmers commonly grow. Farmers in the hill areas of the State leave about 4,000 stalks per acre or an average of one stalk per hill about 3 feet apart. Possibly the fertility of the soil will usually be no more than the equivalent of 30 pounds of nitrogen or enough to grow the average of 4,000 stalks and 15 bushels of corn per acre. Where more plant food is applied, more stalks of corn can be supported, up to 8,000, 12,000, and 15,000 per acre with applications of 60, 90, or 120 pounds of nitrogen.

The 1947 standard corn demonstration requires the use of 90 pounds of nitrogen per acre on the fertilized plots. The complete fertilizer application on No. 1 plots for hill areas will be continued with no change from

10 years ago. This is a net loss of feed grain, while livestock numbers in the State have increased about 16 per cent. Shortage of cottonseed meal and other concentrates blackens the picture still more.

Ten years ago, an average of about one million tons of hay was harvested from 892,000 acres, a yield of 1.16 tons per acre. The yield has increased to 1.38 tons per acre in 1946 to produce 1.2 million tons on 854,000 acres. This increased hay has not substituted for very much grain.

Improved pastures and grazing crops have lessened to some extent the need for grain feeds. Less than a half-million acres of improved pasture could be accounted for 10 years ago, while 1.5 million acres are now reported. The increase will be much more rapid each year.

After allowing due credit for increased production of small grain, hay, and grazing, the feed situation in Mississippi for present livestock needs is just about status quo, compared with the relative situation that existed 10 years ago. The problem in grain production is largely a simple one of yields per acre, and little has been done by most farmers to increase the yields of corn and oats.

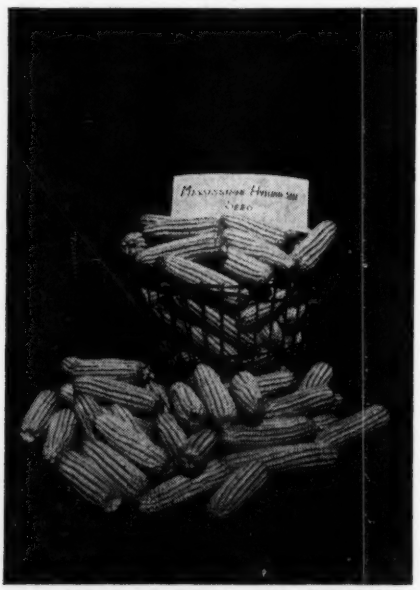

Fig. 2. Dixie 11 hybrid corn yields 15 to 20 per cent more than best open-pollinated varieties.

Corn has been the "stepchild" among the crops in its treatment compared with the cash crop cotton. Probably 90 per cent of the cotton acreage receives reasonably high rates of recommended fertilizer, while not more than 10 per cent of the corn receives any fertilizer at all. This difference in treatment cannot be justified on a basis of difference in returns from a dollar spent for fertilizer for the two crops.

Corn experiments in Mississippi for more than 20 years have shown that nitrogen, in all sections of the State, returns $4 to $5 worth of corn for each dollar spent for fertilizer used on it. This is the same rate of returns as received from fertilizer used on cotton.

The yield of corn could be increased from the 15-bushel average to 25 bushels if each acre were fertilized with 24 to 32 pounds of nitrogen. A 10-bushel increase in the yield on the 2.2 million acres of corn harvested in 1946 would have added 22 million bushels to the 36.4 million bushels harvested. This would have given a record corn crop of 58.4 million bushels. Similar practice for oats would have increased the 31-bushel average yield to at least 45 bushels. This would have added about 5 million to the 11.1 million bushels harvested to make a total crop of 16.1 million bushels. All of this corn and oats should satisfy the grain requirements of the live stock in the State.

While 24 to 32 pounds of nitrogen per acre are generally recommended, very poor hill soils need phosphorus and potash also for growing high yields of corn. Tests and demonstrations are pointing out possibilities of corn production through a balanced fertilizer program.

Special corn-production demonstrations were conducted in Mississippi in

1945 and 1946 with 4-H club boys and adult farmers. The American Potash Institute sponsors the 4-H corn production contest in cooperation with the Mississippi Extension Agronomy Department and county and assistant county agents. A total of 109 4-H boys conducted corn demonstrations in 1945. Complete records were sent in on the 23 demonstrations having the highest yields, for the awards offered in the contest. Eight widely scattered counties were represented. In 1946, 855 demonstrations were conducted by 4-H boys and adults in 62 of the 82 counties, and complete records were sent in on 32 demonstrations for competition for awards.

Fertilizer requirements in the demonstrations follow:

Plot	Treatment	Rate per acre
1	6–8–8 fertilizer or 6–8–4 fertilizer	500 lbs. (applied in water furrow before bedding rows for planting)
	Additional nitrogen	32 lbs. nitrogen side-dressed when corn is about knee-high
2	Nitrogen only	32 lbs. nitrogen in water furrow
	Additional nitrogen	32 lbs. side-dressed
3	Check—no fertilizer used	

Fertilizer in plots 1 and 2 was applied in the water furrow before the land was bedded for planting. These plots also received a side-dressing of 32 pounds of additional nitrogen when the corn was about knee-high.

Corn yields were estimated in the field according to a standard method. The location, general fertilizer treatment, and yields per acre reported in 1946 with average figures compared with demonstrations in 1945 are shown in table 1.

The average yield of the check plots, without fertilizer, was 34 bushels per acre. Average yield on No. 2 plots, receiving 64 pounds of nitrogen per acre, was 61 bushels, or 27 bushels more than the corn which was not fertilized.

Plots No. 1, which received the same amount of nitrogen as plots No. 2, and also phosphorus and potash, averaged 77 bushels. This yield was an increase of 16 bushels per acre which can be credited to the phosphorus and potash, and 43 bushels more than yields on the check plots. Only four demonstration records out of the 32 reports showed negative results from use of complete fertilizer. Returns from nitrogen only were generally in line with yields obtained by the State Experiment Station, approximately one bushel of corn for each two pounds of nitrogen used.

Research and demonstrations also show that maximum yields from fertilizer are obtained by growing many more stalks of corn on an acre than farmers commonly grow. Farmers in the hill areas of the State leave about 4,000 stalks per acre or an average of one stalk per hill about 3 feet apart. Possibly the fertility of the soil will usually be no more than the equivalent of 30 pounds of nitrogen or enough to grow the average of 4,000 stalks and 15 bushels of corn per acre. Where more plant food is applied, more stalks of corn can be supported, up to 8,000, 12,000, and 15,000 per acre with applications of 60, 90, or 120 pounds of nitrogen.

The 1947 standard corn demonstration requires the use of 90 pounds of nitrogen per acre on the fertilized plots. The complete fertilizer application on No. 1 plots for hill areas will be continued with no change from

TABLE 1.—1946 STANDARD 4-H CORN-FERTILIZER DEMONSTRATIONS

County, name, and address	Fertilizer used and yield per acre		
	Plot 1	Plot 2	Plot 3
	500 lbs. 6–8–8 or 6–8–4 before planting plus side-dressing of 100 lbs. ammonium nitrate or 200 lbs. nitrate of soda per acre	100 lbs. ammonium nitrate or 200 lbs. nitrate of soda before planting plus same kind and amount side-dressed	Check no fertilizer
	Bushel yield per acre		
Lauderdale:			
Donald Jolly, R 4, Meridian	45	38	10
Billy McElroy, R 4, Meridian	50	40	10
Leake:			
Benton Atkison, Carthage	58	53	24
Eugene Dabbs, Center	81	76	40
Lowndes:			
Jimmy Simpson, Caledonia	63	36	26
Madison:			
Joe Hayes, Farmhaven	69	47	20
Lewis Henderson, Madison Station	47	32	12
Hugh W. Purvis, Flora	76	52	34
Jack Kirk, Flora	70	58	28
John Endris, Jr., Madison Station	62	49	14
Eldridge Hoy, Madison Station	95	74	42
Neshoba:			
Devon Dearing, R 3, Union	62	24	15
Rankin:			
Audie Mitchell, Star	56	62	25
Arthur Harold Nash, Brandon	76	46	21
Edgar Prestage, Brandon	30	20	5
George Harris, Johns	97	58	43
Simpson:			
Joe B. Boggan, Mendenhall	104	46	36
Scott:			
Marvin E. Goss, Forest	65	44	30
Tishomingo:			
J. T. Skinner, Iuka	92	68	32
Junior Merle Hester, Iuka	100	84	40
Donald Craff, Paden	94	84	24
Frank Walker, Iuka	76	92	60
Junior Merle Hester, Iuka	108	102	80
Clovis Vandifer, Burnsville	104	90	76
James Lee Coker, Iuka	80	68	56
Harold Davis, Burnsville	80	69	41
Jimmie Kirk, Iuka	112	80	40
William Howard Osborn, Tishomingo	112	125	48
Walthall:			
Charles Henry Howell, Jayess	116	60	40
Webster:			
Glen Earnest, Eupora	64	76	54
Robert L. Crowell, Eupora	64	48	44
George Lewis, Lodi	46	43	8
Average all reports, 1946	77	61	34
Average all reports, 1945	78	61	47

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Fig. 1. Part of the campus in front of Administration Building, Ontario Agricultural College, Guelph, Ontario. This turf is kept in good condition by fertilizing to maintain fertility and spraying to control weed growth. It is not artificially watered.

Building and Maintaining Good Lawns

By R. J. Bryden

Soils Analyst, Ontario Agricultural College, Guelph, Ontario

A WELL-CARED-FOR lawn adds a great deal to the beauty of a home, either in the city or on the farm. Every year thousands of dollars are spent in building new lawns or renovating long-established stands. Whether one is starting from scratch to build a new lawn or is attempting to renovate an old one, there are certain fundamental principles that cannot be overlooked if success is to be achieved.

During the past 15 years, it has been the writer's privilege to have analysed all types of soils found in the Province of Ontario on which someone was anxious to establish a lawn. These soils varied from very light sands, sandy loams, and silty loams to clay loams, heavy clays, and highly organic soils. From the standpoint of fertility levels, the variation was just as extreme. Some soils were very high in what we consider essential nutrients, others moderately high, while still others were very low or practically void.

It is safe to assume that grass or clover of some kind can be grown in nearly any location. In other words, a lawn of some type can be established if the proper species are selected and

proper adjustments made as to fertility, drainage, shade, and soil reaction. It is necessary to make a complete study of all the factors involved, and then make the necessary adjustments.

It is well to bear in mind at the outset that a lawn is put down to last a great many years, and that it must hold up under all types of weather and wear. To do this, it must have adequate drainage and sufficient plant nutrients in the proper balance. The soil at all times must be sufficiently aerated to supply the necessary oxygen to the countless bacteria that inhabit it and help to carry on the processes of breaking down organic matter, building up the nitrogen supply, and making available other essential nutrients.

Sandy soils tend to be too open and porous. They do not hold sufficient moisture to give a sustained growth and are apt to become dried out and burnt in hot weather. When one has a light soil to deal with it is necessary to incorporate what might be termed a good top-dressing soil, high in organic matter and well decomposed. This should be mixed with the sand as much as possible and not put on as a layer over the sand.

Heavy clay soils tend to bake and become hard and dry during the heat of the summer, or very wet and puddly in the spring and fall. They often lack sufficient aeration to supply the needs of the bacterial life present. This retards the development of nitrate nitrogen and causes the grasses to turn yellow. To overcome this condition it is necessary to add enough sandy material to the clay to give it greater porosity. This should be done when the clay is dry, and the sand should be thoroughly incorporated with the clay so as to avoid layering of sand and clay. Material high in organic matter will also tend to make the clay more porous.

On a good loamy soil it is much easier to establish a lawn, as loams tend to be open and therefore well-aerated. As a rule, they carry sufficient organic matter to hold an adequate moisture supply, are less leachy, and hold a greater supply of plant nutrients.

A fact that must not be overlooked when considering nutrient requirements of grasses and clovers is that approximately 95 per cent of the dry matter of nearly any plant is made up of carbon, hydrogen, and oxygen, which are obtained from air and water. If the soils are sufficiently aerated and contain enough carbon dioxide, as well as moisture, under favourable weather conditions, the plants will be supplied with these necessary elements of growth.

Soil Reaction

A factor of prime importance is the reaction of the soil; whether it is alkaline, neutral, or acid. Soil reaction is expressed in terms of pH: a neutral soil has a pH value of 7.0; an alkaline soil has a pH of over 7.0. Grasses vary as to their optimum pH needs. Some are able to withstand extreme acid conditions while others prefer less acid soils. Clovers, as a rule, tend to grow best under slightly alkaline conditions. The soil reaction has an influence on the growth and development of bacteria in the soil. It also affects the availability of phosphorus, nitrogen, and potash to the plants. A highly acid condition has a tendency to tie up both phosphorus and potash and decreases the supply of available nitrates. A highly alkaline soil depresses the availability of phosphorus. Taking everything into consideration, a soil having a reaction between pH 6.0 and 6.5 seems to be ideal for a clover-grass lawn. A slightly lower pH would be satisfactory for an all grass lawn, provided there is a sufficient supply of calcium present.

Too much acid can generally be overcome by the use of agricultural limestone or hydrated lime applied to the seedbed or to the lawn itself. The amount to use depends on the acidity of the soil and the type of soil with which one has to deal. This informa-

Fig. 2. Foreground is untreated for weed control. One hundred per cent kill in background. One week after 2-4-D was applied.

tion will be given when a soil analysis is made by the person in charge of the Soil Advisory Service. In the Province of Ontario this work is handled by the Soil Department's Advisory Service at the Ontario Agricultural College located at Guelph.

When considering the building of a new lawn or the renovating of an old one, it is advisable to have a soil test made in order to get a clearer picture of the fertility levels, the soil reaction, and the organic matter content of the soil in question. From this analysis, recommendations as to liming and fertilizer requirements can more satisfactorily be made.

For analysis, care should be given to securing a uniform sample of the soil. On an established lawn, samples of the sod itself should be taken in several places. These can be cut with a butcher knife in triangular cuttings, with 2-inch sides and to a depth of 3 inches. Subsoil samples should also be taken from a depth of 3 to 7 or 8 inches. In this way underlying fertility levels and physical conditions can be studied.

Nutrient Requirements

The levels of fertility should be such as to give an adequate supply of nitrogen, phosphorus, potash, calcium, magnesium, carbon, iron, sulphur, zinc, copper, manganese, and boron. When any of these elements are lacking they can be supplied by the proper use of commercial fertilizers, along with well-rotted manure or other organic materials, as well as soil amendments such as limestone. Care should be taken not to overfertilize, which is often the cause of unsatisfactory results. A soil that has a good physical condition with a reaction of pH 6.0-6.5 and carrying in the top 6 inches of each acre about 200 lbs. available nitrogen, 120 lbs. available phosphorus, 500 lbs. available potash, 1,000 lbs. water-soluble calcium, and about 60 lbs. magnesium oxide, plus sufficient organic matter, should be capable of growing a satisfactory lawn.

These levels of fertility should be maintained. By checking them from time to time, one can determine the fertilizers to use to maintain a good growth of grass. In short, there must be available at all times a well-balanced supply of the three essential elements—nitrogen, phosphorus, and potash. In too many cases nitrogen alone is used as a fertilizer, which tends to give too succulent a growth resulting in a prevalence of mildews, moulds, and various fungus diseases. Winter-killing, also, is often caused by an excess of nitrogen. Therefore, it is important to know existing fertility levels early in the fall, in order that sufficient phosphorus and potash may be added. This will insure a well-balanced mineral supply and minimize losses from winter-killing.

Lawn Grasses

From some of the more important species of grasses commonly used in lawns, a suitable mixture or species can be selected for any given condition.

Kentucky Blue Grass (Poa pratensis) is perhaps the most widely used and most valuable of all lawn grasses. It is hardy and spreads by means of underground rhizomes, producing under proper conditions a dense turf that wears well. It is particularly adapted to loamy, well-drained soils, and will do well on moderately acid to neutral soils.

Canada Blue Grass (Poa compressa L.) forms a rather open sod,

is fairly coarse, and has a light bluish-green color. It is quite drought-resistant, will grow on poor, dry, sandy soils of low fertility, and has a place in a mixture for playgrounds and similarly roughly treated areas where moisture is relatively low.

Rough-Stalked Blue Grass (Poa trivialis S.) does well in shady, moist conditions. This species spreads by means of stolons and produces a fine, dense turf. It is suited to the same conditions as Kentucky Blue Grass.

Red Top (Agrostis vulgaris) is a rapid-growing grass. When sown alone, it forms a coarse, open sod. It thrives in moist conditions, does well under moderately acid conditions, and is also resistant to drought. It should be sown by itself.

Colonial Bent (Agrostis tenuis), also known as Brown Top, Rhode Island Bent, and New Zealand Bent, is an excellent lawn grass, producing the very finest quality lawn. It can be sown alone or in a mixture with Kentucky Blue Grass. It spreads by means of short rhizomes, producing a dense, very fine, uniform turf. This grass does well on mildly acid soils but not on very dry or very wet locations, or under dense shade. It is very susceptible to a disease known as "Large Brown Patch."

Creeping Bent Grass (Agrostis palustris) is particularly adapted to bowling and putting greens. It spreads rapidly by means of long stolons and produces a dense, very fine-leafed turf. It is very susceptible to disease and must receive disease control measures.

Velvet Bent (Agrostis canina) is the most beautiful of all turf grasses under proper conditions. It is tolerant to shade, spreads by means of rhizomes and stolons, and is particularly adapted to bowling and putting greens.

Chewings Fescue (Festuca rubra var. commutata Gaud.) is adapted to poor, dry soils and will also grow in shady locations. It produces a dense, fine turf, very resistant to wear, and tends to become bunchy or tufted. It does not spread.

Creeping Red Fescue (Festuca rubra) is adapted to the same conditions as Chewings Fescue, but has the advantage of being able to spread by means of underground rhizomes and does not bunch. It should be included in mixtures for dry, sandy locations and for shady areas.

Fig. 3. Typical farm home in Eastern Canada. Spacious lawn with spreading oak and maples adorn the landscape.

Crested Wheat Grass (Agropyron cristatum L. Beauv.) is very drought-resistent and winter-hardy. It may be used when artificial watering is not available.

Perennial Rye Grass (Lolium perenne L.) is used where quick growth is desirable. It is not very winter-hardy so is used mostly for temporary swards.

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Soils deficient in available potassium produce crops low in yield and deficient in potassium and other important elements. When potash is applied to these soils, the yields are greatly increased as is also the quality of the crops.

The Potassium Content of Farm Crops

By H. J. Snider

Department of Agronomy, University of Illinois, Urbana, Illinois

THE POTASSIUM content of crops is by no means a constant value. It varies with the variety and stage of growth of the crop and also with soil and seasonal conditions. Within certain limits, crops take up potassium in direct proportion to the amount available in soils. It is not apparent that crops take up too much potassium, although it is sometimes claimed that they do. This apparent excess of potassium taken up by farm crops has been frequently referred to as luxury consumption, and this reference at times has taken the form of a slogan. A late president of the University of Illinois once said that he disliked the use of slogans because they tended to keep people from thinking. The luxury consumption idea may be placed in this same category when applied to plant nutrition.

The potassium content of most farm crops should be somewhere around 1.5 to 2.0% in order to have high yields and desirable quality in the crops. This range in percentages would apply more especially to the leaf and stem portions of crops. It is not likely that most grain and seeds

will come within these limits. Corn grain is usually considerably below, while the stalks at maturity may be within these values. Oat grain is usually slightly below, while oat straw may be within the limit or often above 2%. Wheat grain is, as a rule, below this and under most conditions wheat straw may be slightly below 1.5% potassium. Soybeans at maturity are usually within this limit, but the straw is usually below.

This range, as a desirable percentage of potassium, has considerable support from various sources. The potassium content of various crops in the tables offers strong support of this range in percentages as an optimum. Another bit of interesting data in support of this was sometime ago presented by Dr. H. P. Cooper. Along this line, Dr. Cooper quoted some results on the composition of pasture plants in Great Britain. The plants which were readily eaten had a potassium content of approximately 2% with other quality elements proportionately high. Those plants not eaten by livestock had a potassium content of approximately 1.25% and other desirable elements were proportionately low.

Potassium is not generally credited directly with adding much to the feeding quality of crops. It is, however, generally found associated with certain elements which in turn possess high nutritional value. This characteristic of potassium has been presented many times during the past 20 years by Dr. H. P. Cooper. On this particular point, Dr. Cooper says of Kentucky bluegrass, "It is soft and palatable and grows best on soils which are well supplied with relatively soft elements such as potassium, calcium, phosphorus, and other elements with relatively high oxidation-reduction potentials." He explains further that the harder and less palatable plants, which include poverty grass and sedges, are likely to dominate on acid soils and these harder plants probably utilize some of the harder elements. These elements include magnesium, aluminum, manganese, iron, silicon, and others which have relatively low oxidation-reduction potentials. Redtop is rather a prominent grass in Illinois and may also be placed in this latter group. This grass flourishes on the light-colored, acid soils

TABLE 1.—POTASSIUM CONTENT OF CORN FROM SOILS WITH AND WITHOUT POTASH TREATMENT.

Pounds in stalks—grain and cobs per 100 bu. of grain

Year	No potash	Potash applied
Ewing	*Lbs.*	*Lbs.*
1942	85	159
1944	155	218
1945	91	141
Joliet		
1944	94	129
1945	129	138

Ewing 90 lbs., Joliet 200 lbs. available potassium in the untreated soil.

TABLE 2.—POTASSIUM CONTENT OF GRAIN AND STRAW OF WHEAT AND OATS FROM SOILS WITH AND WITHOUT POTASH TREATMENT.

Field	No potash	Potash applied
Wheat Grain	*Per cent*	*Per cent*
Sparta (80)	.75	.81
Ewing (90)	.88	.72
Joliet (200)	.68	.68
Wheat Straw		
Toledo (80)	.55	1.08
Newton (70)	.41	1.02
Oat Grain		
Sparta (80)	1.14	.72
Toledo (80)	.98	1.14
Minonk (280)	.72	1.20
Oat Straw		
Sparta (80)	.85	1.56
Toledo (90)	1.08	2.48
Minonk (280)	2.28	2.44

Sparta oats a winter variety. Figures in parentheses represent pounds an acre available potassium in untreated soils.

of southern Illinois and here serves a worthy purpose. Redtop hay is unpalatable, and composition results show that it contains relatively large percentages of some of these hard elements.

Few folks realize fully how quickly and to what extent new and improved chemical methods change the course of fundamental research. In Dr. C. G. Hopkins' textbook, published in 1910, the potassium content of stalks, grain, and cobs of 100 bushels of corn was placed at 73 pounds. This value was given with a note of finality and since Dr. Hopkins was a very forceful teacher, this figure came to be accepted and widely quoted. Previous to 1910, and for a time after this date, potassium in crops and soils was determined largely by the platinic chloride method. This method is complicated, slow of operation, and unless in the hands of a highly specialized chemist, is likely to give erroneous results. In 1928 Professor Truog began work on the cobaltinitrite method for the determination of potassium in soils and crops, and from that time on, potassium determinations have been speeded up and have reached a high degree of accuracy. Along this line another method which has added speed and accuracy to potassium determinations in crops was the nitric-perchloric acid method of destroying organic matter in plant material. At present the accumulated data on potassium in its relation to the production of crops are of enormous value. They are quite reliable and frequently differ radically from those of former years. This is only one of the many lines of work which have contributed substantially to our knowledge of the production of crops.

TABLE 3.—POTASSIUM CONTENT OF ALFALFA HAY FROM SOILS WITH AND WITHOUT POTASH TREATMENT.

Field	No potash	Potash applied
	Per cent	*Per cent*
Raleigh	.62	.88
Ewing	.88	1.80
Oquawka	.75	1.04
Joliet	1.80	2.28

All low-potash soils except Joliet. (200 lbs.)

TABLE 4.—POTASSIUM CONTENT OF SWEET CLOVER FROM SOILS WITH AND WITHOUT POTASH TREATMENT.

Part of plant	No potash	Potash added
	Per cent	*Per cent*
	Ewing—May 15	
Tops	.95	2.13
Roots	.51	2.12
	Raleigh—May 16	
Tops	1.04	1.32
Roots	.75	.75
	Kewanee—April 19	
Tops	2.18	2.95
Roots	1.14	.83

Ewing 90 lbs., Raleigh 90 lbs., Kewanee 220 lbs., available potassium an acre in untreated soils.

The amounts of potassium which go into the production of 100 bushels of corn (stalks-grain-cobs) vary apparently with the season and with soil conditions. Some of the lower amounts in table 1 are considerably above the 73 pounds given in the Hopkins' text of other years, and the higher amounts are nearly three times this value. Where potash was applied, the corn crop contained amounts of potassium ranging from 129 to 218 pounds per 100 bushels of corn. The increases were largest on the potassium-deficient soils of the Ewing field. These larger amounts of potassium were accompanied by a greatly increased yield of corn. Potash treatment on these deficient soils has averaged about a 50% increase in corn yield. The very wet season of 1944 caused a relatively large uptake of potassium on soils both with and without potash treatment on the Ewing field. The 1944 crop on the Joliet

TABLE 5.—POTASSIUM CONTENT OF SOYBEANS FROM SOILS WITH AND WITHOUT POTASH TREATMENT.

Part of plant	No potash	Potash applied
	Oblong (90 lbs.)	
Beans	1.61	1.90
Straw	.37	.51
	Joliet (200 lbs.)	
Beans	1.81	1.87
Straw	.55	.87

field showed no unusual effect of this season on the potassium content. This field is located some 250 miles north of Ewing and represents a rather high level of soil fertility along with a probable difference in weather conditions.

The effect of potash treatment was not so marked on the composition of grain as on straw. Wheat and oat grain did not, in all comparisons, show an increase in potassium content where potash was added to the soil. Both wheat and oat straw had relatively large increases in potassium content where potash treatment was used, especially on deficient soils.

Alfalfa hay had considerable increase in potassium content where potash was added to the soil. There were very low percentages in the hay on the low-potash soils (60 to 100 lbs.) and a relatively high percentage in the hay from high-potash soils (200 lbs.) without potash treatment. The hay from the four fields in table 3 represents the first cutting of the season.

Sweet clover tops and roots at plow-under time had considerable increase in potassium content due to potash treatment. The Kewanee field, which is located in northern Illinois, had an earlier plow-under date (April 19) than did the Ewing and Raleigh fields (May 15-16), which are located in southern Illinois. This difference in stage of growth accounts partly for the high percentages in the tops, 2.18 and 2.95% on the former field.

Soybeans are relatively high in potassium and on deficient soils the amount in the beans was increased by potash treatment from 1.61% to 1.90%, an average of five years. The straw was relatively low in potassium, apparently because of the large concentration of this element in the beans at maturity of the crop (table 5).

Red and alsike clovers had an increased potassium content where the

(*Turn to page* 46)

TABLE 6.—POTASSIUM CONTENT OF RED AND ALSIKE CLOVERS FROM SOILS WITH AND WITHOUT POTASH TREATMENT.

Analysis made at usual haymaking time 1944.

Field	No potash	Potash applied
	Per cent	*Per cent*
Red Clover		
Easton (80 lbs.)	1.47	1.92
Dixon (170 lbs.)	1.30	1.70
Alsike Clover		
Toledo (90 lbs.)	1.01	2.61
Brownstown (100 lbs.)	2.00	3.39

TABLE 7.—POTASSIUM CONTENT OF HAY CROPS AND CORN STOVER WITH AND WITHOUT POTASH TREATMENT.

Analyses were made at the customary hay stage for each crop.
Corn stover represents the full dent stage.
Sparta Experiment Field.

Crop and year	No Potash	Potash applied
	Per cent	*Per cent*
Red Clover 1945	1.04	2.18
Lespedeza 1943	.81	1.01
Lespedeza 1945	.88	1.34
Vetch (winter) 1944	1.66	3.10
Vetch (winter) 1945	1.70	1.90
Cowpeas 1943	.98	1.66
Cowpeas 1944	1.37	1.47
Timothy 1945	1.33	1.82
Corn stover 1942	1.01	2.00

Available potassium 80 lbs. an acre in untreated soil.

Fig. 1. Here is a pasture showing small humps of dark, vigorously growing plants. The humps are spots where the grass is growing well because of droppings or excretions from livestock.

More Palatable Grass Is More Nutritious

By M. F. Wichman and R. A. Harling

Soil Conservation Service, Fort Worth, Texas

THERE have been a lot of tests run to show that forage varies in its palatability and food value. The cow, in her position as one of the prime consumers of forage, indicates without resort to chemical analysis the quality of plant foods at any given time by her willingness to graze where the grass is most nutritious. As a result, she yields more pounds of beef and milk than she would if she nipped on the poorer spots all the time.

Here's an example of her selectivity in daily diet. You have probably noticed small humps of dark, vigorously growing plants in pastures and fields, particularly in small grains. The humps actually are spots where the grass is growing well because of droppings or excretions from livestock. If you've paid attention to the spots, you've noted that she either grazed the spots as close as possible or left them alone almost entirely. The latter instance is usually a sign that the livestock droppings are a little too concentrated. They need spreading by a section harrow with a heavy piece of chain attached to scatter the manure piles uniformly. If the droppings are spread after one or two good rains, you can usually find her grazing small spots formerly oc-

cupied by droppings. Those spots will be supporting tall dark-green vegetation.

The tall growth of plants around these spots where manure was dropped does not tell the whole story of the feeding value present. Some seasons of the year the droppings and excretions may cause the soil solution to become more concentrated than the plant solution. If that happens the plants die. Cattle don't graze there. In areas of high rainfall or in areas of low available nitrogen this doesn't happen often.

The question of just what are the food values of plants growing where manure had lain arose recently in the course of pasture development work in the G. R. Canada ranch near Anahuac on the Gulf Coast of Texas. Mr. Canada is a supervisor of the Trinity Bay Soil Conservation District.

He asked why the areas right out in the middle of his native unimproved pasture were so closely grazed. He understood that the grass from those darker spots was generally better than other grass away from the manure area, but he didn't know that there was a great difference in the chemical content of the plants benefiting from the excretions and droppings.

Last summer we took two samples of grass which cattle were eating in an area less than six feet square. One sample was from a dark green spot where the Bermuda grass was less than an inch and a half tall. The other sample was taken from normal Bermuda grass three to four inches tall. We found that the dark green probably was caused by urine, which of course is a source of nitrogen and potash.

Back in our Soil Conservation Service operations laboratory, we tested and found the Bermuda grass from the dark green area contained 2.74 per cent nitrogen and 17.1 per cent protein. The normal Bermuda grass contained 1.66 per cent nitrogen and 10.3 per cent protein.

That information, naturally, told us why the cattle were grazing the green

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Fig. 2. Pasture improvement work on the Canada ranch. A fertilizer distributor is at work in the background. At left is native pasture which carries one head of livestock on 10 to 15 acres. The improved pasture will carry a cow to two acres when established. The dark spots showing up in the native pasture are wax myrtle, an invading plant which has forced Mr. Canada to fertilize his pasture in self-defense. He uses limestone, superphosphate, and potash.

Ten Years of Soil-Building In Vermont

By Thomas H. Blow

County Agent, Caledonia County, St. Johnsbury, Vermont

TEN years of Agricultural Conservation program practices in Vermont have done much to raise the standards of fertilization, the use of lime, and the production of more and better crops, hay, and pasture. On the State level in 1935 before the program started, Vermont farmers were using 3,500 tons of lime per year. In 1944, the tonnage used under the program reached a high of 118,035 tons and a total of 668,309 tons for the period 1936 through 1946. The story was similar for superphosphate, as the figures showed 3,366 tons used in 1935; in 1944, which was also a high year for superphosphate, 41,118 tons used; and for the period 1936-1946 inclusive, a total of 327,610 tons. In 1943, the only year in which a mixed grade of fertilizer was offered under the program, 13,489 tons of 0-14-14 were used.

Handicapped through the shortage of potash, the dairymen of the State have had to curtail the use of high-potash fertilizers, and it has cost them money and production to do so.

Starting out in 1936 the program set five objectives as goals of accomplishment for rebuilding Vermont soils. These were as follows:

1. To increase soil fertility by increasing the mineral content of the soils which are known to be deficient in calcium, phosphorus, and potash.
2. To prevent soil erosion and to conserve water resources by permitting a thick grass sod cover.
3. To protect maple sugar orchards from grazing, thus promoting growth of young maples.
4. To protect and improve forest cover by reforestation, selective cutting, and other forestry improvement practices.
5. In cooperation with the Extension Service, to assist in developing farm leaders.

In some counties of the State, soil tests have been used as guides in making recommendations. Typical of these were the tests made in 1937 in Caledonia County on more than 900 samples taken in every town in the County. In this particular County, the need for potash was even greater than that of phosphorus, as shown by the soils in the low and very low groupings. A comparison of these two ingredients 10 years ago showed up as follows: For phosphorus, 377 tests were in the low group while 492 were in the low group for potash; in the very low group, phosphorus showed 137 tests as compared to 161 for potash. This was taken as an indication that in this particular County the need for potash was even greater than for phosphorus. On many dairy farms where extra potash was used, the results in its favor have been very clear cut.

In reporting to the Agricultural Conservation committees in Caledonia County on 10 years of the program, the county agent and writer brought out the following details and made specific recommendations for the future.

Past Results

Farmers from a low of 660 to a high of 1,297 in the County, have participated since 1936. In dollars and cents return, this period of years has actually put into their pockets a total of $813,155.61. But it has done some-

thing more than just that. It has replaced some of the much needed minerals which have been both crop-used and leached through the more than 150 years of farming and cover removal. Acres and acres of much better hay land have been grown, and field after field of legumes has replaced the less valuable grasses. Seedings which previously had been made with no complete fertilizer and only manure as plant food have been receiving partially adequate applications of minerals.

In support of this, the 1945 census figures in the County show 37,055 head of livestock as compared to 31,949 in 1940. In milking cows, 22,049 were kept in 1945 as compared to 19,766 in 1940; and in milk production 14,635,-378 gallons were produced in 1945 as compared to 11,527,842 gallons in 1940. Not all of the credit for these increases should go to the Conservation program or to the use of fertilizer, but without a doubt these played their part in bolstering soils for greater production and allowed dairy farmers to follow a very intensive soil-mining program during the war emergency period.

The Years Ahead

In Caledonia County, the 1945 census shows 2,185 farms with an average size of 152.8 acres. The total cropland involved is 95,421 acres, of which 6,249 acres are pastured. The total land and building valuation is nearly nine million dollars, and it takes approximately two million dollars worth of machinery to operate the investment. In all, some 7,455 persons are living on the farms of the County and of this number 2,188 are under 14 years of age. These are the folks that are definitely concerned with the farm and soil heritage that will be passed down to them by the present operators. There is a real challenge to the farmer in providing a good living for those on the farms and leaving the soil in a better condition than it was when he took it over. If these things are done, the livestock and crop production end of the business will take care of itself.

What Can Be Done

As pointed out, considerable progress has been made with growing more and better hay, but with pasture management the surface has not been scratched. In Caledonia County alone, some 205,-000 acres of land are pastured by the cattle of approximately 1,861 farmers, yet of this number only 196 farmers used 6,000 acres of cropland in a pasture rotation system. This is where management of pastures must play a large part in the economic success or failure of dairying in the years ahead.

In June 1946, the Caledonia County Agricultural Conservation committeemen visited several practical dairy farms in central Maine, and it was interesting to see how these dairymen carried on. The committeemen saw Fred Nutter at Corrina, Maine, carrying some 80 Holstein milkers and not using one acre of old, rough pasture land in his set-up. He top-dressed his crop and pasture land with 8-16-16 at about 500 lbs. per acre once a year, turned in his dairy animals when the grass was five to eight inches high, kept them there for four to five days, and then moved them to a new field. The waste grass on the former area was then clipped and the sod given a rest until it was again ready to be fed off.

Don Corbett at Winslow, Maine, another Holstein breeder, was handling his herd of 35 to 40 milkers in much the same way and had five small fields of approximately five acres each devoted to his rotational pasture system. The same story was true at the Harold Shaw farm at Sanford, Maine, and in not one instance did old, rough, worn-out pasture sods enter the picture. Good ladino and white clover sods along with brome and bluegrass, were providing the feed that made economical milk production for these Maine farmers. Back of these productive sods was a strong, sound fertilization program

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Above: **A Vermont heritage—the dairy farm snuggled in the Green Mountain Hills. Farms such as these must be passed along in at least as productive a capacity as when they were taken over.**

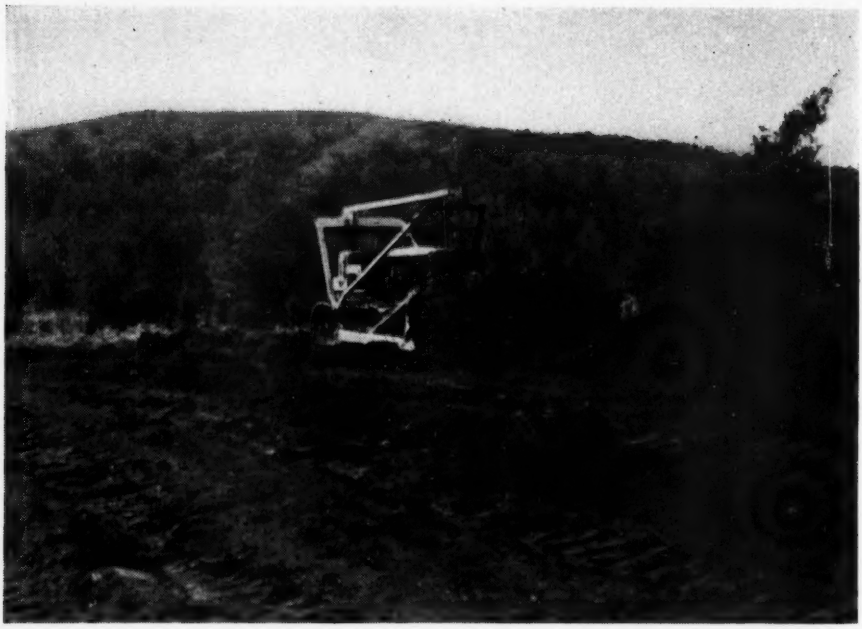
Below: **The Jersey herd on the farm of John Lenton, Passumpsic, Vt. This farm has maintained good Jerseys, good pastures, and had good farm management by the Lentons for over half a century.**

Above: **The completion of a 1,000-ft. ditch on the Guy Labay farm at West Burke, Vt. This large meadow had been wet and the grass was running out. It will be top-dressed with complete fertilizer.**

Below: **The foundation of a good seedbed on a Ryegate farm. Lime was applied under the Agricultural Conservation Program.**

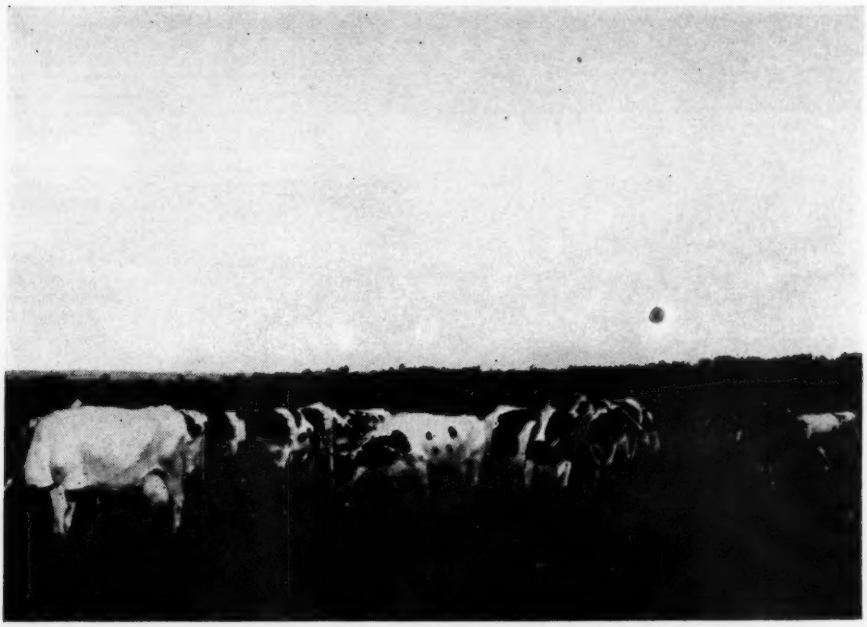
Above: **Paul Morrison, Barnet, Vt., hauls in an excellent crop of completely fertilized hay with his "buck rake."**

Below: **The Caledonia County A.C.P. committeemen visit the Don Corbett dairy farm at Winslow, Maine. Here the herd is on one of the rotated cropland fields which had been top-dressed with 8-16-16 fertilizer.**



Above: Forty acres of former permanent pastureland were put back into shape with a bulldozer on the Simpson farm at Waterford, Vt. A 4-16-20 fertilizer and a seeding of ladino and brome grass now provide excellent pasture for fifty or more milkers.

Below: Eighty Holsteins on 8-16-16 top-dressed cropland at the Fred Nutter farm, Corrina, Maine. Caledonia committeemen were very much impressed with the excellent production being secured both in grass and milk pail at the Nutter Farm.



The Editors Talk

Fertilizers and Bugs

We have heard much about the preference of cattle for well-fertilized pastures over grass that had not been fertilized. Now comes the disclosure that insects too may show a similar discrimination.

In work conducted at the Florida Citrus Station at Lake Alfred, Entomologist W. L. Thompson has found that when the numerous major and minor nutrients were applied to citrus in the combinations to give the best growth and yield the infestations of certain insect pests were also increased. The trees lacking the proper fertilization did not present much of a spray control problem, but neither did they present much of a harvest problem due to poor yields. By working out a spray program adapted to the properly fertilized trees the insects were brought under control and at the same time the trees made remarkable improvement in vigor and yield.

Other cases where the properly nourished plant will be much less susceptible to insect attack and injury have been reported and in all probability this is likely to be more common. The work at Lake Alfred, however, shows that such will not always be the case and only by a well-rounded program of proper nutrition and insect pest and disease control can the maximum results be produced.

The entire citrus research program at Lake Afred under the direction of Director A. F. Camp is an extraordinary integration from the viewpoint of overcoming soil deficiencies, disease, pest infestations, weather hazards, and other problems incidental to the growing of the crop in Florida. A highly practical and effective program has been worked out based on research and observations over a period of years. Dr. Camp says, "The philosophy upon which the programs were based is a reversal from the older idea of waiting until trouble showed up and then correcting it, which might reasonably be called a philosophy of correction. Following this philospohy a grower did not spray for rust mites until they became numerous, or for scales until they started to do serious damage, or apply copper until dieback became serious. In contrast to the philosophy of correction, we have consistently followed a philosophy of prevention in which the program is designed to prevent the occurrence of those things which we have found reasonably certain to become problems in the average grove. While it might be true that in occasional groves unnecessary things will be done under such a general program; nevertheless, if this group of unusual groves constitutes less than 5 per cent of the acreage, then we have considered that it would be better to outline the program on what 95 per cent of the growers might expect. Some growers will undoubtedly rise up in indignation at the idea that any general program practice has indicated that such a program can fit their particular grove, but actually it is workable when based on sound soils information. Obviously we cannot see every grove owner and recommend corrective measures, but we can recommend a program which should avoid the necessity of corrective measures. Moreover we have found that by the time corrective measures are obviously needed production has fallen off. . . . Finally our program is based not on one year's performance but on the production of

consistently large crops of good quality fruit, and at the same time it maintains the tree in excellent condition, able to resist drought and cold to the maximum."

In contrast to the fertilizer recommendations in most states where nitrogen phosphoric acid, and potash are the only plant foods recommended, often in Florida the fertilizer analysis regularly contains six figures in the order of nitrogen, phosphate, potash, magnesium, manganese, and copper since it has been found that the latter three secondary or minor nutrients are needed for practically all conditions. Zinc is usually recommended, but applications are frequently more effective when applied in the spray.

The all-over fertilizer analysis recommended for citrus is 3–4% N, 6% P_2O_5, 8% K_2O, 2–3% MgO, 1% MnO, and ½% CuO. In some cases this same analysis might be used in all three applications during the year while in other cases analyses may be varied seasonally but the total at the end of the season should approach the ratio mentioned above. Dr. Camp says, "It should be kept in mind at all times that the attainment of high efficiency in the utilization of nitrogen or any other element is dependent upon high production. The presence of any deficiency in any appreciable degree results in reduced yield and makes the attainment of high efficiency impossible."

In looking over the large experimental groves, one cannot help but be impressed with the contrasts between the blocks of trees receiving the treatments which have been found to be most effective and the trees not receiving the well-rounded program advised by Dr. Camp and his associates. The amount of damage due to cold injury this last season was very great on the blocks not properly fertilized whereas the effects on the trees receiving the recommended fertilizers and spray program now are scarcely noticeable.

This work has been of untold value to the citrus growers not only in Florida but in nearly all other sections of the world where the crop is grown. Dr. Camp's advice and personal consultation are in constant demand from foreign as well as domestic growers because of the proven results of the well-balanced program for citrus production which he has developed.

DISCUSSING the rapid rise in the use of fertilizers during the war, and the need for further increases in the future, W. A. Minor, assistant to the Secretary of Agriculture, has stated:

"We know that even though we are using far more lime and fertilizer than ever before, we are not using nearly enough to maintain, restore, and improve the soil. We have never developed farming systems for the Nation as a whole that would replace soil fertility as fast as we used it. That situation should and must be corrected.

"We have much to learn about the relation between the use of plant-food materials on the soil and the nutritional value of the products grown on the land. But we do know that there is a definite connection, and as we increase our knowledge of nutrition and gradually develop our food-buying habits on the basis of that knowledge—which we are doing more and more—greater emphasis undoubtedly will be placed on the use of plant-food materials."

Mr. Minor said that Department of Agriculture records show that, compared with the prewar averages, the 1945 use of fertilizer nitrogen was up by nearly 75 per cent, the use of phosphorus up 90 per cent, and the use of potash nearly doubled.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1920.....	15.9	17.3	125.3	141.7	61.8	182.6	16.46	25.65	....
1921.....	17.0	19.5	113.3	113.1	52.3	103.0	11.63	29.14	....
1922.....	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923.....	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924.....	22.9	19.0	68.6	149.6	106.3	124.7	12.66	32.25	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941.....	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942.....	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943.....	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	149.0	192.0	109.0	141.0	16.40	52.70	....
1945.....	22.4	42.6	139.0	200.0	114.0	149.0	15.10	51.80	....
1946									
April.....	23.59	42.9	162.0	245.0	116.0	158.0	15.00	48.00	....
May.....	24.09	43.0	157.0	251.0	135.0	170.0	14.80	49.60	....
June.....	25.98	59.0	147.0	251.0	142.0	174.0	14.70	51.50	....
July.....	30.83	56.7	148.0	275.0	196.0	187.0	15.00	60.00	....
August.....	33.55	48.6	143.0	280.0	180.0	178.0	15.10	59.10	....
September...	35.30	48.8	128.0	224.0	173.0	179.0	15.40	57.80	....
October.....	37.69	53.0	122.0	209.0	171.0	188.0	16.10	66.00	....
November....	29.23	43.8	123.0	200.0	127.0	189.0	17.20	89.90	....
December....	29.98	43.5	126.0	210.0	122.0	192.0	17.70	91.50	....
1947									
January.....	29.74	39.0	129.0	220.0	121.0	191.0	17.50	90.40	....
February.....	30.56	31.9	131.0	228.0	123.0	199.0	17.50	88.20	....
March.....	31.89	33.6	139.0	235.0	150.0	244.0	17.40	88.00	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1920.....	128	173	180	161	96	207	139	114	....
1921.....	137	195	163	129	81	117	98	129	....
1922.....	185	228	95	114	116	109	98	135	....
1923.....	231	190	133	137	129	105	110	183	....
1924.....	185	190	98	170	166	141	107	147	143
1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	93	81	109	74	87	110
1938.....	69	196	80	83	76	64	57	97	88
1939.....	73	154	100	85	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	107	117	107	81	211	129
1942.....	153	369	168	136	143	124	91	202	163
1943.....	160	405	188	232	174	154	125	231	245
1944.....	167	420	214	219	170	160	138	234	212
1945.....	181	435	199	228	178	169	127	230	224
1946									
April.....	190	429	232	279	181	179	126	213	282
May.....	194	430	225	286	210	192	125	220	177
June.....	210	590	211	286	221	197	124	228	185
July.....	249	567	212	313	305	212	126	266	163
August.....	287	486	205	319	280	201	127	262	162
September...	285	488	184	255	269	202	130	256	154
October.....	304	530	175	238	266	213	136	293	151
November....	236	438	176	228	198	214	145	399	207
December....	242	435	181	239	190	217	149	406	166
1947									
January.....	240	390	185	351	188	216	147	401	238
February.....	246	319	188	260	192	225	147	391	275
March.....	257	336	199	268	235	276	147	390	299

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910-14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.59	5.16
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946						
April	1.75	1.42	7.81	5.77	4.86	6.71
May	1.75	1.42	9.08	6.10	4.86	7.30
June	1.88	1.42	10.34	6.42	4.86	7.90
July	1.88	1.42	11.62	8.15	5.34	9.60
August	2.22	1.46	16.88	8.14	6.07	12.14
September	2.22	1.46	10.32	6.95	6.07	12.14
October	2.22	1.46	13.20	7.12	8.30	12.14
November	2.22	1.46	15.19	11.26	12.14	12.75
December	2.22	1.46	14.63	11.37	12.14	11.17
1947						
January	2.36	1.46	12.98	11.06	12.14	10.32
February	2.41	1.46	10.01	11.06	12.14	10.17
March	2.41	1.46	11.98	11.06	12.50	10.50
Index Numbers (1910-14 = 100)						
1922	113	90	173	132	140	142
1923	112	102	177	137	136	147
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946						
April	65	50	223	163	144	191
May	65	50	259	173	144	207
June	70	50	295	182	144	224
July	70	50	332	231	158	273
August	83	51	482	231	180	345
September	83	51	295	197	180	345
October	83	51	377	202	246	345
November	83	51	434	319	360	362
December	83	51	418	322	360	317
1947						
January	88	51	371	313	360	293
February	90	51	286	313	360	289
March	90	51	342	313	370	298

Wholesale Prices of Phosphates and Potash **

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1922	.566	3.12	6.90	.632	.904	23.87	....
1923	.550	3.08	7.50	.588	.836	23.32	....
1924	.502	2.31	6.60	.582	.860	23.72	....
1925	.600	2.44	6.16	.584	.860	23.72	....
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.570
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946							
April	.650	2.20	6.40	.535	.797	26.00	.200
May	.650	2.20	6.40	.535	.797	26.00	.200
June	.650	2.30	6.45	.471	.729	22.88	.176
July	.650	2.60	6.60	.471	.729	22.88	.176
August	.700	2.60	6.60	.471	.729	22.88	.176
September	.700	2.60	6.60	.471	.729	22.88	.176
October	.700	2.60	6.60	.471	.729	22.88	.176
November	.700	2.60	6.60	.535	.797	26.00	.200
December	.700	2.60	6.60	.535	.797	26.00	.200
1947							
January	.700	2.60	6.60	.535	.797	26.00	.200
February	.720	2.60	6.60	.535	.799	26.00	.200
March	.740	2.77	6.60	.535	.797	26.00	.200
	Index Numbers (1910-14 = 100)						
1922	106	87	141	89	95	99	....
1923	103	85	154	82	88	96	....
1924	94	64	135	82	90	98	....
1925	110	68	126	82	90	98	....
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946							
April	121	61	131	75	84	108	83
May	121	61	131	75	84	108	83
June	121	64	132	66	76	95	80
July	121	72	135	66	76	95	80
August	131	72	135	66	76	95	80
September	131	72	135	66	76	95	80
October	131	72	135	66	76	95	80
November	131	72	135	75	84	108	83
December	131	72	135	75	84	108	83
1947							
January	131	72	135	75	84	108	83
February	134	72	135	75	84	108	83
March	138	77	135	75	84	108	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1922	132	149	141	116	101	145	106	85
1923	143	152	147	114	107	144	103	79
1924	143	152	143	103	97	125	94	79
1925	156	156	151	112	100	131	109	80
1926	146	155	146	119	94	135	112	86
1927	142	153	139	116	89	150	100	94
1928	151	155	141	121	87	177	108	97
1929	149	154	139	114	79	146	114	97
1930	128	146	126	105	72	131	101	99
1931	90	126	107	83	62	83	90	99
1932	68	108	95	71	46	48	85	99
1933	72	108	96	70	45	71	81	95
1934	90	122	109	72	47	90	91	72
1935	109	125	117	70	45	97	92	63
1936	114	124	118	73	47	107	89	69
1937	122	131	126	81	50	129	95	75
1938	97	123	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	124	131	127	86	56	130	102	77
1942	159	152	144	93	57	161	112	77
1943	192	167	151	94	57	160	117	77
1944	195	176	152	96	57	174	120	76
1945	202	180	154	97	57	175	121	76
1946								
April	212	188	160	97	57	175	121	78
May	211	192	162	99	57	189	121	76
June	218	196	163	100	60	203	121	70
July	244	209	181	103	60	230	121	70
August	249	214	187	116	67	293	131	70
September	243	210	181	108	67	223	131	70
October	273	218	197	115	67	286	131	70
November	263	224	198	127	67	382	131	78
December	264	225	204	127	67	376	131	78
1947								
January	260	227	206	126	69	359	131	78
February	262	234	209	124	70	329	134	78
March	280	243	216	128	70	354	138	78

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Since June 1941, manure salts are quoted F.O.B. mines exclusively.

**** The weighted average of prices actually paid for potash are lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Agricultural Mineral Sales as Reported to Date for Quarter Ended December 31, 1946," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., FM-140, March 26, 1947.

"Commercial Fertilizer Sales as Reported to Date for Quarter Ended December 31, 1946," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., FM-141, March 26, 1947.

"Topdressing Small Grains," Ga. Exp. Sta., Experiment, Ga., P. Bul. 581, Jan. 27, 1947, J. G. Futral.

"A Study of the Effect of Fertilizers on Various Characters of the Cotton Plant," Agr. Exp. Sta., La. State Univ., Baton Rouge 3, La., Bul. 406, Aug. 1946, H. B. Brown.

"Maryland Fertilizer Facts for 1946," State of Md. Insp. and Reg. Serv., College Park, Md., March 14, 1947.

"Fertilizer Grades and Ratios for Minnesota," Agr. Ext. Serv., Univ. of Minn., St. Paul 8, Minn., Ext. Folder 143, Feb. 1947, C. O. Rost, Paul M. Burson, and E. R. Duncan.

"The Dairy Cow as a Conserver of Soil Fertility," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Bul. 730, Sept. 1946, Firman E. Bear, Willis A. King, and Carl B. Bender.

"Fertilizer Sales in Ohio in 1946," Dept. of Agron., Ohio State Univ., Columbus 10, Ohio, March 10, 1947.

"Recommended Fertilizer Practices for 1947," Agr. Ext. Serv., Utah State Agr. College, Logan, Utah, M. S. 689, March 1, 1947, D. W. Thorne and H. B. Peterson.

"Fertilizer Tonnage Sales Survey Report for Washington for July 1, 1945 to June 30, 1946," Inst. of Agr. Sciences, State College of Wash., Pullman, Wash., Cir. 43, March 1947, S. C. Vandecaveye.

Soils

"Soil Treatment to Improve Permanent Pastures," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir. 310, Oct. 1946, Arnold W. Klemme.

"Erosion Control Methods," Agr. Ext. Serv., Univ. of Tenn., Knoxville, Tenn., Publ. 299, April 1946, G. E. Martin.

"Economic Land Classification of Pulaski County," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 398, June 1946, W. L. Gibson, Jr., and Farrar V. Shelton.

"Economic Land Classification of King William County," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 399, July 1946, G. W. Patteson and Z. M. K. Fulton, Jr.

"Wheat Production and Properties of Palouse Silt Loam as Affected by Organic Residues and Fertilizers," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 476, Sept. 1946, Henry W. Smith, S. C. Vandecaveye, and L. T. Kardos.

Crops

"Eight Points for Arkansas Dairymen," Ext. Serv., College of Agr., Univ. of Ark., Fayetteville, Ark., Leaf. 75, March 1946, Paul Caruth.

"Results of Experiments, 1937-1945," Dominion Exp. Substa., Dept. of Agr., Delhi, Ontario, Can. 1947.

"Better Legumes and Grass Seedings," Ext. Serv., College of Agr., Univ. of Conn., Storrs, Conn., Ext. Folder 10, Feb. 1947, J. S. Owens.

"Extension in Connecticut," Agr. Ext. Serv., Univ. of Conn., Storrs, Conn., A. R. 1945.

"Citrus Industry of Florida," State Dept. of Agr., Tallahassee, Fla., A. F. Camp, Robert C. Evans, and L. G. MacDowell.

"Ladino White Clover for North Georgia," Ga. Exp. Sta., Experiment, Ga., Cir. 153, Jan. 1947, Orien L. Brooks and Guy D. Buice.

"Growing Lettuce in North Georgia," Ga. Exp. Sta., Experiment, Ga., Bul. 579, Jan. 17, 1947.

"Grape Growing in the Mountain Section of Georgia," Ga. Exp. Sta., Experiment, Ga., Bul. 580, Jan. 17, 1947.

"Centipede Grass for Lawns," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Mimeo. Paper 48, March 1947.

"Hawaii Extension Reconverts, 1945-46," Agr. Ext. Serv., Univ. of Hawaii, Honolulu, T. H., Bul. 44, Jan. 1947.

"Essentials for Growing Alfalfa," Dept. of Agr. Ext., Purdue Univ., Lafayette, Ind., Ext. Bul. 242 (2nd Rev.), 1947.

"The Story of Wheat Improvement in the Pocket Area," Dept. of Agr. Ext., Purdue Univ., Lafayette, Ind., First Annual Report, 1946, H. R. Lathrope.

"Eaton Oats," Exp. Sta., Michigan State College, East Lansing, Mich., Art. 29-21, Feb. 1947, E. E. Down and J. W. Thayer, Jr.

"Supplementary and Emergency Crops for Minnesota," Agr. Exp. Sta., Univ. of Minn., St. Paul 8, Minn., Bul. 390, June 1946, A. C. Arny, Ralph Crim, and R. O. Bridgford.

"Seasonal Grazing Recommendations for Yazoo-Mississippi Delta," Agr. Exp. Sta., Miss. State College, State College, Miss., Serv. Sheet 402, Aug. 1946.

"Growing Strawberries in Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir. 311, Jan. 1947, T. J. Talbert and A. D. Hibbard.

"4-H Projects for Missouri, 1947-1948," Agr. Ext. Serv., Univ. of Mo., Columbia, Mo., Manual 40, Oct. 1946.

"Root Crops," Ext. Serv., Univ. of N. H., Durham, N. H., Cir. 266, Jan. 1945, J. R. Hepler, M. C. Richards, and J. G. Conklin.

"Standards for Classifying Peach Characters," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Bul. 728, Oct. 1946, M. A. Blake and L. J. Edgerton.

"Planning the Pasture Program," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 501, Sept. 1946, C. S. Garrison and Gilbert H. Ahlgren.

"Sixty-Fifth Annual Report, 1946," N. Y. State Agr. Exp. Sta., Geneva, N. Y.

"Small Fruit Culture," Agr. Exp. Sta., Wooster, Ohio, Spec. Cir. 74, Feb. 1947, Wesley P. Judkins.

"Science for the Farmer," Agr. Exp. Sta., State College, Pa., Suppl. 2 to Bul. 480, March 1947.

"The 1946 Cotton Contest for Higher Yields and Better Quality," Agr. Ext. Serv., Clemson Agr. College, Clemson, S. C., Cir. 295, Jan. 1947.

"Keys to the Protein Feed Problem," Agr. Ext. Serv., Univ. of Tenn., Knoxville, Tenn., Publ. 300, W. P. Tyrrell.

"A Summary of the 1946 Texas Corn Performance Tests," Agr. Exp. Sta., Texas A. & M., College Station, Texas, P. R. 1051, Dec. 20, 1946, J. S. Rogers, D. H. Bowman, J. W. Collier, and R. G. Reeves.

"Maturity Studies with Canning Peas," Agr. Exp. Sta., Utah State Agr. College, Logan, Utah, Bul. 328, March 1947, L. H. Pollard, E. B. Wilcox, and H. B. Peterson.

"The Vermont Agricultural Experiment Station, Its Accomplishments, Program and Needs," Agr. Exp. Sta., Univ. of Vt., Burlington, Vt., Dec. 1946.

"Fruit Varieties in Middle Virginia," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 402, Nov. 1946, W. S. Flory, Jr. and B. G. Anderson.

"1946 Varietal Tests," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 403, Dec. 1946.

"A Primer on Hybrid Corn—How It's Produced," Ext. Serv., Univ. of Wis., Madison, Wis., Sten. Cir. 248, Oct. 1946, E. D. Holden.

Economics

"Arizona's Agricultural Wealth," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 205, Oct. 1946.

"Origin and Destination of Fruits and Vegetables Produced in Maryland," Agr. Exp. Sta., Univ. of Md., College Park, Md., Misc. Publ. 54, Dec. 1946, P. R. Poffenberger and S. H. DeVault.

"Wheat-Flax-Soybean Outlook, Looking Ahead in 1947," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Ext. Pamph. 152, Feb. 1947, D. C. Dvoracek.

"Problems in Farm Management and Production Costs on 40 Farms in Northeast Mississippi," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 431, June 1946, W. J. Edens.

"Prospective Income from Average Size Farms on Grade 2 Missouri Land," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 497, June 1946, Ramey C. Whitney.

"Negro Farm Families Move Ahead in Tennessee," Agr. Ext. Serv., Univ. of Tenn., Knoxville, Tenn., Publ. 298, G. C. Wright.

"Efficient Use of Farm Labor in Tennessee," Agr. Ext. Serv., Univ. of Tenn., Knoxville, Tenn., Publ. 301, March 1947, James L. Anderson.

"Economic Aspects of Cotton Production, Henry and Madison Counties, Tennessee, 1942," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Mono. 208, Sept. 6, 1946, H. J. Bonser and C. C. Mantle.

"Costs and Returns in Growing Corn, Henry and Madison Counties, Tennessee, 1942," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Mono. 209, Oct. 5, 1946, H. J. Bonser and C. C. Mantle.

"Comparison of Different Methods of Harvesting Cotton," Agr. Exp. Sta., Texas A & M, College Station, Texas, Bul. 683, Oct. 1946.

"Vermont Farm Outlook for 1947," Agr. Ext. Serv., Univ. of Vt., Burlington, Vt., Feb. 1947, Roy S. Beck.

"World Food Situation 1946-47," Office of Foreign Agr. Rel., U.S.D.A., Washington, D. C., Third Preliminary Report, WFP 3-46, Nov. 4, 1946.

"World Food Situation 1946-47," Office of Foreign Agr. Rel., U.S.D.A., Washington, D. C., Fourth and Final Report, WFP 1-47, March 3, 1947.

Some Recent Books on Agriculture

The Nature and Properties of Soil by T. L. Lyon and H. O. Buckman. (Macmillan Company, New York. 4th edition, 1943. $3.50.)

This has long been the standard college textbook on soil science in this country. Frequent revisions keep the subject matter well abreast of the latest developments and thoughts in this rapidly developing field. It is a scientific book, but soils are considered primarily from the crop-producing standpoint, with technical phases well explained. The book covers soil formation and composition; physical, chemical, and biological properties; and soil fertility relationships.

Soils and Fertilizers by F. E. Bear. (John Wiley & Sons, New York. 3rd edition, 1942. $3.50.)

Written by one of the leading soil scientists of the country, the first part of this takes up the origin and the chemical, physical, and biological properties of soils. The middle section is devoted to soil management for the production of crops and the maintenance of soil fertility. The latter part covers the production and use of fertilizers and lime.

Field Crops by H. C. Rather. (McGraw-Hill Book Company, New York, 1942. $3.75.)

This is a textbook covering practically all the commonly grown field crops. The crops are described and pertinent information is given on their adaptation and cultural practices. Varieties, diseases, and pests of individual crops are discussed. Chapters on silage, pastures, soil conservation and management, tillage, haymaking, and feed production are included.

The Nature and Prevention of Plant Diseases by K. S. Chester. (Blakiston Company, Philadelphia, Pennsylvania. 1942. $4.50.)

Descriptions and control methods are given for the diseases of most of our economic plants. Other chapters are devoted to aspects of nutrient deficiencies, parasitic seed plants, and nematodes. The subject matter is arranged by the causal organism or factor rather than by crops. While the book thus is written primarily as a textbook, a complete index makes it suitable as a reference.

A Practical Guide to Successful Farming edited by W. S. Moreland. (Halcyon House, Garden City, New York. 1943. $3.95.)

An extraordinary amount of information about nearly everything connected with farming in its many aspects is contained in this volume. Selecting and financing a farm, soil management, production of crops and livestock (including goats and beeves), farm structures, marketing, and rural-life problems are among the broad subjects covered. Thirty-seven chapters written mostly by experts of the New Jersey Agricultural Experiment Station give practical, accurate, and highly useful information on individual subjects. While it is written mainly from the viewpoint of northern agriculture, much of the information will apply anywhere. This book could well be on the table for ready reference by farmers, county agents, and teachers.

Vegetable Gardening in Color by D. J. Foley. (Macmillan Company, New York. 1943. $2.50.)

Prepared primarily for the small gardener, this is an attractive book. Brief descriptions and cultural notes are given for nearly all common and many uncommon vegetables, small

fruits, and herbs, along with general cultural information. Separate chapters are included on general cultural directions, planning a garden, pests and diseases, and storing and cooking vegetables. Numerous illustrations in color give rise to the title of the book.

Artificial Manures by A. B. Beaumont. (Orange Judd Publishing Company, New York. 1943. $1.50.)

This is a practical book furnishing background information on organic matters in the soil and discussing a preparation of artificial manures and composts as well as the use of green manures and cover crops. It would be useful to the small gardener, truck-crop grower, and general farmer.

Fertilizer Bands For Home Gardens

Home gardeners find it easy to apply practically one of the important findings of research on the application of commercial fertilizers—the desirability of placing the fertilizer in a band two or three inches to the side of the seeding row and two inches below the level of the seed in the row. This makes the fertilizer readily available for feeding the young plants but keeps it away from the seeds while they are germinating and might be injured by the chemicals of the fertilizer. In large scale tests the fertilizer specialists of the U. S. Department of Agriculture and of the State experiment stations have proved this in field tests with many crops, including most vegetables.

General farmers who have not the special fertilizer equipment needed for placing fertilizers in bands have difficulty in making use of this improved method. The home gardener, however, can get the good effects easily—by using his hoe. It is only necessary to first lay out the planting row—usually with a cord stretched between two stakes. Then gouge out with the hoe a trench parallel to the cord and about three inches to the side and three inches deep. Place the fertilizer at the bottom of this trench and replace the earth. Next, open the planting row along the cord and plant as usual.

For placing the band of fertilizer in the bottom of the trench, it is convenient to use either a tin can with a hole about a half inch in diameter punched in the bottom or a clay flower pot that has a drainage hole. With a little practice it is easy to train hand and eye to move the pot or can along the trench just fast enough to allow the fertilizer to run out at the rate suggested for each ten feet of planting row. To shut off the flow, put a finger over the hole.

Ten Years of Soil-Building in Vermont

(*From page* 26)

which for the most part was high-analysis, double-strength materials. These dairymen had long since learned that to stay in the milk production race, year in and year out, such a plan of pasture provision and management paid them good dividends.

The Caledonia County committeemen saw much in their three-day visit to Maine that could be brought back and put into practice in their own communities. In no instance were the Maine farmers visited trying to do the impractical or making their accomplish-

ments on soils that were better than those in Vermont. That this was true was evidenced through the discussions en route. All were of the opinion that we really had the edge, when it came to a comparison of natural soil resources. In other words the Vermont dairyman just had to be convinced, or otherwise sold, on the idea of better pastures through a management program.

From the best figures obtainable in Vermont as a whole, it is estimated once our hay and pasture soils are brought up to a pH of 6 that 200,000 tons of ground limestone will be needed annually to maintain such a condition. With phosphorus, once the optimum level is obtained, it will take 100,000 tons of superphosphate annually. With potash, after 100,000 tons are used to bring the hay and pasture soils up to an optimum level, it will take at least 50,000 tons of 60% potash annually to maintain such a condition.

In addition, additional fertilizer could be used on the 112,000 acres of land that should be cleared for new pasture development. Also with drainage work being carried on, another 100,000 acres of land could be put into shape for better cultivation and fertilization through the construction of open ditches and tile drainage.

The more adequate conservation and use of the farm manure supply can and should work hand in hand with our entire plan of dairy farm management. Whether this will be along the line of manure pits, liquid collecting tanks, or such labor-saving devices as gutter cleaners, new type spreaders, etc., remains to be developed, but the next few years undoubtedly will bring along many changes in the handling of manure.

Such a program is by necessity a long-time program. It will take time, money, fertilizer, machinery, and much good management. However, it is not beyond the impossible to do it, providing we lay the groundwork now and keep in mind that the heritage challenge that presents itself is one of vision and is needful of common sense consideration.

Potato-Growing Developments in New England

(*From page* 10)

that a 20-pound application of borax depressed the yield of potatoes on two farms in Maine to a significant degree, that a 10-pound application reduced the yield, and that even a 5-pound application reduced the yield on one farm and caused no increase on another.

It is barely possible that Aroostook soils are better supplied with boron than certain other New England soils. It is also an undisputed fact that boron is toxic to many crops if applied in even moderate quantities, so that if the soil on which an investigator is working has a fairly good level of boron, the addition of more boron in the fertilizer might prove to be toxic. Our work in New Hampshire appears to indicate a need for borax on potatoes on a soil near Colebrook. As a two-year average, the 5-pound application has increased yields significantly, whereas the 20-pound application has given better yields than the check but not so good as the 5-pound amount, suggesting we may have passed the limit of efficiency for borax with the 20-pound amount on the potato crop.

We have noted that the potatoes produced with boron have a little better appearance and that they remain whiter after cooking for a longer period than those not grown with boron. We believe that boron merits further study in connection with the potato crop.

We have been giving some attention in New Hampshire to calcium and sulphur as plant nutrients, applied in

Fig. 4. Potato leaves showing magnesium deficiency. Healthy leaves are on extreme left in both rows. Going toward the right, magnesium deficiency is shown in progressive stages.

the form of gypsum. The need for calcium might arise on soils which have never been limed and which have reached a pH value of 5.0 or below. This is the same condition, of course, which might forecast a magnesium deficiency. The need for sulphur would be intensified on soils low in organic matter, such as would be found in potato rotations, or on land fertilized over a long period with double-strength fertilizers. Low-analysis superphosphate which is used in compounding ordinary fertilizers contains both calcium and sulphur in gypsum which is developed in the manufacturing process. High-analysis fertilizer has very little gypsum in its make-up.

Working in the greenhouse with a soil low in calcium and sulphur, Kardos and Blood[12] found a definite stimulation to potatoes from both these elements. Calcium appeared to be more involved in increasing the set of tubers while sulphur increased their size. The evidence in this greenhouse study shows the need for these elements as nutrients and their possible function, but field results have not shown consistent increases for gypsum, or for either calcium or sulphur applied in other forms. It would appear that fertilizers probably carry sufficient calcium and sulphur for temporary needs of the crop.

Studies in Maine, reported by Hawkins, Chucka, and Brown,[12] showed no advantage for using copper, iron, manganese, nickel, or zinc added to the fertilizer as sulphates. Nickel, like boron, may be toxic if applied in too large amounts.

Evidence that chlorine has a depressing effect on starch formation is accumulating in New Hampshire. Chlorine is a component of potassium chloride (muriate of potash) and this substance is commonly employed as the carrier of potash. Since the starch content of the potato has a direct and favorable influence upon mealiness in the potato, anything that depresses starch formation reduces the cooking quality. Tests in 1946 seem to indicate that the starch content of potatoes already high in starch is influenced more by using potassium sulphate instead of the chloride than those which have a lower inherent starch content.

It is doubtful if the public is discriminating enough to pay more for potatoes fertilized with the more expensive sulphate, since at the moment potatoes are bought mainly on their size and outward appearance rather than upon their starch content or cooking quality.

Varieties

The need for new varieties of potatoes has been felt for some time, and this need, thanks to the effort being placed upon plant breeding, is now coming to fruition. To be specific, the Green Mountain potato, long the favorite of New England growers and the best cooking variety so far at our disposal, suffers more and more in reputation because of its susceptibility to net necrosis. Its place in popular favor has been taken over by the Katahdin, a much better looking potato, with a higher percentage of marketable tubers, and one which does not exhibit net necrosis. But it is inferior to the Mountain in cooking quality. This is true, also, of Chippewa, Houma, and Sebago, three other varieties each with other faults besides poor cooking quality, each susceptible to something or other—Chips to leafroll, Houma to late blight, and Sebago to black leg. Popular on the market and with growers at present, we do not believe they are the potatoes our farmers will be growing in 1960.

The Mohawk potato promised to supersede Green Mountain. Shaped like an Idaho baker, with a high percentage of marketable tubers, smooth skin, and equal to the Mountain for cooking, this variety has proved to be susceptible to leafroll and shows net necrosis in the tubers. In fact, all the good-cooking, mealy varieties exhibit net necrosis, which leads to the conclusion that this trouble is always coupled with a relatively high starch content. If this is true, then the potato that finally takes the place of the Green Mountain must have as one of its attributes an inherent resistance to leafroll. We feel sure that the plant breeders will come through on this one.

There are other special situations that need new varieties. Resistance to scab is one of them. Potato growers have been hampered in their soil fertility program by not being able to lime their soil because of the danger of potato scab. In New Hampshire, our growers are so fearful on this score that they use no lime until clover absolutely fails to grow.

Thanks to plant breeders, the Ontario potato, which seems to be quite resistant to scab, has been developed. This variety may not be the final answer to the scab problem but it does indicate what can be done. We grew the Ontario in 1946 by the side of the Pawnee variety, the latter showing about 20 per cent scab while the Ontario was scab free.

Blight-resistant varieties are appearing, too, and may cheapen potato costs because of the necessity of applying fewer sprays and less material. Three of these were grown in New Hampshire in 1946. All stood through a severe blight infection in August while other varieties on adjacent plots went down. Needless to say, the three had high yields in '46, the highest in our tests. In a year in which late blight does not occur, other varieties might equal them in yield. But these instances show the possibilities that lie ahead for the potato grower now that the plant breeders are vitally interested in his problems.

Keeping Abreast

We can expect constant changes in the potato industry. To keep abreast of them, growers must keep informed. DDT may cause some reduction in potato acreage. Judicious and not extravagant fertilization should be the watchword in the coming period, during which time growers should accept the opportunity to adopt better rotations to renew their organic-matter supplies reduced by heavy cropping.

Supplies of the minor elements in our soils are in delicate balance. Mag-

nesium is already a must on potato farms; boron doubtless soon will be in certain areas. Others in this trace group may become necessities before long. Above all, we must keep our eyes on new varieties and choose those that are developed to suit our specific purposes and markets.

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More Palatable Grass Is More Nutritious

(*From page* 24)

areas into the ground. They were simply getting more nutrition per mouthful there, and were smart enough to do their eating where the menu was good.

Field observation and laboratory tests have told us a number of things about adding nitrogen and other amendments to the soil. An application of nitrogen on pure stands of grass will increase the weight of total forage. It will also increase the protein content. The more protein, the more palatable and nutritious the grass. Adding nitrogen also helps grass produce better seed crops.

But although the urea helped increase the feeding value of the grass considerably, nitrogen alone should not be supplied to grazing lands like Mr. Canada's. He has been able to develop grass and legume pasture which has put more than a pound of beef per day on cattle, stocked at the rate of more than one animal unit per acre. His Dallis grass, white Dutch clover, Bermuda grass, and common lespedeza pastures were developed by adding lime, phosphate, and potash. The amounts applied per acre have varied. The heaviest applications have been 3 tons of limestone, 600 pounds of superphosphate, and 100 pounds of 60 per cent muriate of potash. Nitrogen was supplied by the winter-growing clovers, which put the expensive fertilizer into the ground so that it was available to the Dallis grass when it germinated the following spring. He applied the amendments after Soil Conservation Service technicians assigned in his district helped him with a complete soil analysis made in the Soil Conservation Service operations laboratory.

After developing 120 acres of grass and legume pasture which cost about $15 per acre, Mr. Canada asserted that the type of pasture development he was following as part of the coordinated soil conservation program on his place was entirely economical. He is currently in the process of building another 100 acres of the improved pasture and figures an acre and a half of improved pasture is the equivalent of 15 acres of native pasture. Besides the immediate cash gains, he points out that stock diseases are less prevalent and that he raises a better crop of quarter-bred colts

Fig. 3. Bob Harling, Soil Conservation Service technician assigned in the Trinity Bay Soil Conservation District, inspects a drainage ditch built on the G. R. Canada ranch. Engineers from Mr. Harling's office helped Mr. Canada lay out the ditch lines as part of the soil conservation program being installed on the ranch.

from mares running on the improved pasture.

Here's a bit of 1946 grazing history on Mr. Canada's improved pasture:

He had 150 head of native sheep on the field during the late winter and early spring of 1946. They were in poor condition before he turned them on the pasture, but in 60 days all the ewes developed excellent flesh while suckling young lambs.

The sheep were taken off the pasture March 15, 1946, and five days later 20 brood mares with colts and 14 two-year-old quarter horses were put on the area. April 8, 1946, he turned 80 head of weaned heifer calves on the pasture together with 12 yearling horses. Altogether, he has had 20 mares with colts, 12 yearling horses, 14 two-year-old horses, and 80 calves on the pasture since April 8, 1946.

The quarter horses are doing exceptionally well; the colts are slick and fat. The heifers have been weighed every month and have made exceptional gains for the area. Several of the heifers have been drenched for stomach worms and Mr. Canada believes the entire lot would have made better gains if he had followed a systematic worming program.

The average weight of the heifers has been as follows:

April 8	400 pounds
May 9	418.8 pounds
June 9	432.8 pounds
July 9	469.7 pounds
Aug. 9	491 pounds
Sept. 9	not weighed
Oct. 9	550.4 pounds

The pasture is located adjacent to the Gulf Coastal Marshes, one of the largest wintering grounds for geese. In late October, the large Canadian ringneck geese were attracted to the tender green clover pasture. All during the winter around 500 geese can be found on the pasture any time. Since the pasture is the only spot of green vegetation for miles around, it is impossible to keep the birds driven off. Because of the geese eating the vegetation, Mr. Canada's stock get very little winter grazing from the pasture.

From April 8, 1946, to October 9, 1946, the pasture produced 101 pounds

of beef per acre on 80 yearling heifers. Additional gains were produced on the 66 horses which grazed the pasture together with the yearling heifers. Usually the native prairie pasture of the area produces good weight gains from the time the grass puts out in the spring until the middle of June. Mr. Canada's improved pasture, of course, is beating that a long way.

A drainage-conservation program on his ranch preceded the pasture improvement work. The improved pasture is on land which is getting the benefit of well-designed drainage ditches which carry off the water. Soil Conservation Service technicians in the Trinity Bay Soil Conservation District helped with his drainage, pasture improvement, and other conservation measures.

The Potassium Content of Farm Crops

(*From page* 22)

soils were treated with potash. The alsike hay on the Toledo field had a high of 2.61% and that on the Brownstown field was up to 3.39% potassium. These high percentages and relatively large increases were probably due to the very wet season of 1944 in southern Illinois where these two fields are located (table 6).

Six different crops from the Sparta experiment field had a potassium content which ranged from .81% up to 3.10%. This rather wide range was due partly to difference in crop variety, part to seasonal effect, but the larger part of the difference may be attributed to potash treatment of the soil. This field is located on the light-colored, deficient soils of southern Illinois (table 7).

In practically all of these field tests the land without potash treatment had limestone and phosphate treatment. When potash was added it was used in addition to limestone and phosphate. In most cases the crops on these experiment fields were in a four-year rotation. Approximately 400 pounds of muriate of potash per acre were applied during the rotation. Usually the corn crop received 200 pounds, the wheat crop 100 pounds, and the clover, alfalfa, or other hay crop got 100 pounds per acre. The amounts of muriate of potash applied to the soils were substantial but not excessive. Over a period of years there has been some slight build-up of available potassium in the soils where potash treatment has been regularly practiced.

Building and Maintaining Good Lawns

(*From page* 18)

White Clover (Trifolium repens L.) becomes established quite rapidly. Grass growing in association with it benefits from the nitrogen fixed by the bacteria which form the nodules on clover roots. White Clover tends to stay green during warm, dry weather. It frequently winter-kills, leaving bare patches in the lawn.

In most cases a mixture of seeds rather than a pure species should be sown in lawns. Many people who are acquainted with the beautiful greens maintained by most golf and bowling clubs, desire the same type of lawn. It must be pointed out that these bent grasses take a great deal more care in every way and are more susceptible to disease. For the average home-owner, therefore, a well-chosen mixture suit-

GENERAL FERTILIZING SCHEDULE
FOR ESTABLISHED LAWNS

Time	Fertilizer	Amount per 1,000 sq. ft.
Early April.....	Sulphate of Ammonia.....20% or Nitrate of Soda.....16% or Nitraprills.....33%	3 lbs. 4 lbs. 2½ lbs.
June 15.....	Nitrogen fertilizers as above if turf has not been growing too well	as above
September 1–15.....	4–12–6	4–5 lbs.
October 15.....	A good time to apply top-dressing of composted soil, well-rotted manure, or fine black peat (if necessary)	1 cu. yd.

GENERAL REMARKS: Before applying fertilizers, rake lawn well both ways. Apply fertilizer and rake well again both ways. If necessary, give a light watering to prevent burning and to help wash fertilizer into soil for quick action.

able to the environment encountered should be selected.

Fertilization

Where fertility levels are moderately low, a fertilizer such as 4-12-6 applied at about 25 lbs. per 1,000 sq. ft. of lawn would be a satisfactory foundation application. The fertilizer can be applied broadcast at the time the seedbed is prepared. To get uniform distribution it is advisable to mix the fertilizer with an equal volume of clean, dry sand and sow one-half the mixture each way. The fertilizer should be well raked into the surface soil. The new seedbed should be firm with just enough loose material on top to give the seed good coverage and allow for sufficient aeration.

Seeding

The best time to seed a new lawn in most parts of Eastern Canada is from August 15 to September 15, depending somewhat on the location. When a soil is prepared at this time the late seeding of weeds is avoided and the new grass seedlings have sufficient time to develop a good root system with enough top-growth with which to go into the winter. Then in spring the new lawn makes an early growth before the hot, dry summer weather arrives. If seeding must be done in the spring it should be done as early as possible, and on a seedbed prepared the fall before. The amount and kind of seed to sow depend on the type of lawn desired. As a rule, 3 to 5 lbs. of seed are required for 1,000 sq. ft. of lawn. In sowing, an even distribution is desirable. By dividing the seed in half and sowing both ways this can be accomplished. The seed should be raked in both ways and should be well covered but not too deeply. It is well to roll the lawn after having sown the seed. Finally, it should get a light raking. A light sprinkling with a spray fine enough to avoid washing the seed out of the ground should be given if the weather is dry.

Mowing

A newly seeded lawn should not be mown too short the first season, especially in the hot weather. On the other hand, the grass should not be allowed to grow so long that it causes too much shading. The mower can be adjusted to cut at different heights. In the average, for a new lawn, about 1½ inches is the desired length to cut. This will give sufficient protection to the young grass. After a lawn has

become well-established, it can be cut to about one inch, and frequently enough so as not to have to rake off the cuttings. This will help to keep up the organic matter of the soil. In the late fall a sufficient top should be left for the winter, but if the grass goes into the winter with a heavy top it is likely to smother out if a heavy snow-covering is encountered.

Watering

Many home-owners water lawns too frequently. This should be avoided; watering once or twice a week should be sufficient, provided the lawn is given a thorough soaking at the time. Light, frequent waterings tend to dry out the upper layer of soil during the hot, dry weather. New lawns should receive a light, even spray, but not too frequently. Early morning is the proper time for watering in hot muggy weather. This will give the grass time to dry off before evening. Evening or night watering tends to cause fungus diseases to develop.

Weed Control

In establishing a new lawn, if the seedbed has been thoroughly prepared, weeds will have been eradicated prior to seeding. Only the highest grade, weed-free seed should be used. High soil fertility will encourage quick development of the grasses to the detriment of weed growth. It is advisable to go over newly seeded lawns and spud out any weeds as soon as they appear.

For general purposes, lawn weeds may be divided into two classes: the annuals, which complete growth and reseed in one year; and the perennials, which live for several years. By preventing the annuals from going to seed, they can be easily disposed of. In the case of the perennials, it is necessary to destroy the whole plant. Many of the perennials possess underground root stalks in which a reserve food supply is stored, and from which, even though the tops are destroyed, they have the power to grow new plants. Most of these perennials can be elimi-

SEED MIXTURES FOR DIFFERENT CONDITIONS

(Per cent by weight)

Condition	Kentucky Blue Grass	Red Top	Colonial Bent	Creeping Red Fescue	Rough Stalked Blue	Canada Blue Grass	Crested Wheat	Rate of seeding Lbs. per 1,000 sq. ft.
Fertility high, adequate moisture	75 80 70	10 20	25 10 10					3–4 3–4 3–4
Fertility low, dry	20	20		40		20		5
Fertility high, moist, shaded	30	10	10		50			4
Fertility medium, dry, shaded	10	20	10	60				5
Fertility good, semi-dry, no artificial watering	20			20		10	50	5

White clover can be added to any of these mixtures, except shaded areas, up to 5% if desired.

nated by some of the new chemical weed-killers.

Turf Diseases

The demand for better lawns has increased the use of finer-leafed grasses. These grasses appear to be more susceptible to some of the common diseases.

A disease known as Brown Patch is very common. It appears during the hot, humid, sultry weather of the summer or early autumn and it is caused by the same organism responsible for Rhizoctonia in potatoes *(Rhizoctonia solani)*. Brown patches appear very suddenly as various-sized, discolored areas. New spots in the morning may be covered over by a fine cobweb-like growth which is the mycelium of the fungus. Around the edges of a new spot a dark ring or smoke screen frequently will be found. The grass within the ring has the appearance of being scalded.

The disease known as Dollar Spot also appears suddenly during the growing season. The spots are 1 to 2 inches in diameter. The grass in these spots takes on a withered, bleached appearance.

Snow-Mould appears early in the spring. The fungus causing this disease is Fusarium nivale. The disease progresses favorably at near-freezing temperatures with an abundance of moisture. It appears as irregular circles less than a foot in diameter, having a dirty white, gray, or even green cast.

These diseases can be readily controlled by the use of various commercial fungicides when they first appear. Precautionary measures can be taken to prevent them during the warm months. Care in watering is of prime importance in the control of diseases during hot summer weather.

Maintenance

Once a satisfactory lawn has been established a little care can keep it in a strong and vigorous condition, provided a few simple rules are followed:

1. Keep up a well-balanced fertility level by following a fertilizer schedule.
2. Maintain a good physical condition by keeping up organic matter and spiking when necessary.
3. Practice care in watering.
4. Mow at the proper time and height.
5. Control weeds.
6. Remove, in the fall, leaves and other material that may be thick enough to smother grass during winter.
7. Eliminate excess shade by properly pruning trees to let in as much light as possible.
8. Re-seed when necessary.
9. Keep off lawn as much as possible during winter and early spring.
10. Rake lawn well both ways in spring and fall.

Increasing Grain Production in Mississippi

(*From page* 14)

1946. Nitrogen only, with thick spacing, will be used on soils in the Delta area.

Early plantings of corn generally produce higher yields than late plantings. Plantings made in late March to the 10th of May usually produce 40 to 60 per cent more corn than plantings made in late May and June, especially on upland soils. Wet bottom lands generally cannot be planted until late May or June.

Newly developed and adapted corn hybrids should also contribute to higher corn yields in Mississippi. Dixie 11 and Dixie 17 are two new hybrids developed by the Mississippi Experiment Station. Tests indicate yields which are 15 to 20 per cent higher than yields of the best open-pollinated varieties. In 1946, 170 bushels of Dixie 11 were distributed to county extension workers for demonstration purposes. More than 1,000 bushels of this seed

have been allocated to the agents for distribution to farmers in 1947. Single-crossed seed has been distributed to a few farmers for planting 200 acres for production of double-crossed seed of Dixie 11. Seed of Dixie 17 will be available for demonstrations over the State in 1948.

It should be recognized that a 20 per cent increase in a 15-bushel yield is only 3 bushels of corn, and 8 bushels for a yield of 40 bushels. The use of hybrids will be expected to spread only as the corn yields are increased through the basic fertility practices.

Hundreds of experiments and demonstrations are determining and pointing out improved practices which increase production of grain. Heavy fertilization, early plantings, thick spacing, use of adapted hybrids or varieties, and proper cultivation will produce more corn. As soon as these practices become routine with most of the farmers, we may grow plenty of grain feed.

How long will it take to establish this happy state, and how can the rate of progress toward the goal be speeded up? Do we still have a selling job to do? Farmers are now recognizing their problems and are ready to tackle them. Fertilizers will be made available in a year or two in much larger quantities. If we are inclined to become discouraged, it should be recognized that fertilizer tests and demonstrations for cotton were continued for 15 to 20 years in making the use of fertilizer a routine practice. It should not take so long for corn and oats if we really want livestock.

The rate of spread of desired practices by farmers in grain production can be speeded up. Ample nitrate materials must be made available, along with complete fertilizers. Leadership must be informed, motivated, and activated. Continuous wide-spread field demonstrations must be visited by many farmers. Most farmers "know more than they do." It takes the "seeing" of demonstrations to "inspire" many of them to action on their own farms. These and all of the other common tools used in education may be employed in a more intensive way. They will speed up the spread of practices which will produce more grain in Mississippi for more livestock.

Teaching

(*From page* 5)

tall, forbidding lady who probably never got more than sixty dollars a month wages in her whole teaching career. Those things of course are seldom openly measured or used to attract recruits to the teaching profession. You can't exist on some pupil's fond memories after your bones have mouldered away. Yet I can't help feeling that one who takes a little of the reward in respect and reverence is not entirely missing the bus.

My hunch is that the wages and the honors were too meager to be reckoned as the reason why our generation had such excellent teachers. It seems to me that a deeper feeling for public service as such and a greater inner light to impart knowledge must have animated the best of our teachers back then. Of course, the sum total of accumulated facts and the field of knowledge man possessed in our school days do not compare in complexity or in magnitude with the whole realm of wisdom and science which teachers must touch upon today. This reason may well call for better paid teachers to compete with commerce, but it cannot explain the deeper philosophy which makes the good teacher function as powerfully as a good parent—and often even better.

ON every hand these days reports come to me about the scandal of the era showing up in the dearth of teachers of any kind—good, bad, or indifferent—and the many schools which are obliged to close for lack of instructors. Some states and counties have sent out SOS calls for the oldsters of the teaching craft, the ones who started out in our day and quit the profession to get married and raise pupils for somebody else to teach. They give these folks a hasty once-over and plug them into gaps with a temporary certificate, hoping they won't do too much harm or become too fuddled over new subjects.

Much wiser and better is the plan to encourage recruits to the teaching craft by an organized and systematic effort; a system of selection while the trainees are in the formative school period, and a gentle pressure exerted to that end by their teachers and associates. Literature has been issued and distributed to hasten this hunt for the finest available timber, and campaigns are under way to enlist these top layers of the youth crop.

It deserves to succeed. I hope it succeeds at a faster clip than the parallel drive now afoot to get more students to devote their lives to library work and nursing and dental occupations. Librarians are just about as few and far between as teachers—less than a hundred being graduated in all the library schools of the country last year. The gentle duties of the nurse are not regarded with youthful fervor, and the young men anxious to clean and fill molars are scarce.

Those who are spearheading the teacher recruiting drive use plausible arguments. They recognize the disadvantage of low salaries relative to other professions, but these handicaps are being steadily reduced by an aroused public opinion, they state. The emphasis is placed on the personal satisfactions of teaching and the opportunity for a place of civic honor and social prestige, with vacation for travel, study, and relaxation. In other words, the idea is that other jobs have received so much glamour that the role of the teacher in making the country better has been sidetracked, perhaps in favor of jobs that entertain and amuse.

It strikes us that much can be done in country communities to encourage this recruiting of the best one-third of the available young people to enter the teaching profession through thorough organization, including the homes and social gatherings. But the high percentage of these talented and attractive personalities eventually seek a home and a family life of their own, so the turnover is rapid and the present campaign must be continuous and persistent. The women soon yearn for wifely duties not always compatible with teaching, and the men recruits get restless and often enter other lines which seem to offer better pay and more exciting experiences.

IT must be a continuous program from now on. Official reports reveal that out of the twenty-seven million school pupils in this country fully two million depend for their leadership and their daily instruction upon persons unable to qualify for even the very lowest standard of teaching certificates.

Moreover, about five million more pupils get lessons from teachers with less than a four-year college course behind them. It is also known that more than five million children of school age are not attending school at all, part of this being because of a scarcity of teachers available at the prices offered.

The war years did something to our teaching staff, as well as to the rate of training for teaching jobs. Last October only 71,000 men and women enrolled in teacher colleges for full-time work. Just before the war broke out, the average attendance at these preparatory schools was over 90,000.

It also develops upon close scrutiny of these 71,000 enrollees that a good percentage of them have no intention to teach classes as a profession. They are going to these institutions because they could not find room elsewhere.

YES, there are a larger number of men enrolled in these colleges than there were before the war. But let's not get fooled by that situation. The idea is to enter the teacher-training courses while waiting for a chance to enroll in some liberal arts college or university. About 60,000 veterans are studying in this way at the various teacher colleges of the country, but that represents less than three per cent of the enrollment under the G. I. bill of rights act.

Since 1941 the country has lost 350,000 qualified teachers over and above normal expectations. This leaves 75,000 positions either entirely abandoned or left vacant. There are over 100,000 persons with emergency licenses engaged in daily teaching. Of the total enrollment in all colleges and universities, about seven per cent claim they intend to teach school upon graduation. Twenty years ago the percentage was about twenty-five per cent expecting to teach school following their college course.

Higher guaranteed salaries, with room for advancement to superior performers, plus a sensible adjustment of the teaching load to a point where every pupil has a closer relation with his teacher are among the broad remedies proposed.

Your doctor or lawyer has his education and personality to bargain with as he begins his career, just like the teacher does. But the teacher often chafes because he has so little power to increase his income and build up his financial reserves; and he notices that his college chum who entered the legal or medical world gets ahead faster. Budget economy campaigns come swooping along in the aftermath of war or in a depression period, and the teacher must defer his reward to a distant day. Hired for some public service too often poorly appreciated, the servant of the town or city or state has to take what the politicians hand him and keep mum.

Naturally, the average harassed teacher fails to check the other less rosy side of the picture for the brethren engaged in personal body services or court-room tangles. He often overlooks the long hours, the ungodly midnight calls, the dull procedure in preparation of cases, and the nervous tension of such callings; and likewise he forgets that there are overdue accounts and bad collections involved. At least the teacher has some time to himself, does not worry overmuch about other people's physical or mental ailments or crimes, and usually gets his check on time without recourse to any pressure.

I presume no influence is greater or more charged with potent power for future things than the influence that deals with developing minds. It almost scares one to think this over and to know that only when ignorance is done away with and we can see through sham and greed are we going to govern our nations in the ways of peace and harmony.

RIGHT and wrong often scale down to common sense versus stupidity. So if we can teach kids to see clearly and weigh fairly and get sufficient background to uphold the dignity of man and avoid senseless and useless prejudices, it sort of seems like we could brush off a lot of the things that cause friction and start wars.

Teachers in common schools have a chance to reach the big majority of the people who run this country in later life. Many of the citizens of this day and age never went beyond eighth grade or high school. This doesn't mean that we don't need teachers who have high-

class college degrees. Your teacher should always be a mile or so ahead of the pupil in educational attainments. That is, he should be unless the teacher gets snooty and snobbish through too many false notions about educational superiority. Rather than see that happen I'd go back to Mark Hopkins and his hollow log and sit on one end of it until Domesday.

I am for any approach to the teacher problem which puts emphasis upon human relations and companionship and the open mind. If we have to economize on facilities let's be cheap about the frills and furbelows of the classroom, and even about the books and globes and charts, rather than to set up a gaudy modern assortment of tools and find ourselves without a good teacher to handle them.

EDUCATION is taking a much larger share of the real estate tax bill than it did forty years ago, but is it wrong to say we are probably getting that money back with interest? Kids are not so neglected these days when they are a trifle goofy or out of adjustment. They learn faster because teachers know how to teach better. We all benefit by school improvements, even us old codgers who haven't put foot into a schoolroom for a decade. The last war showed us how blamed smart those youngsters were when put up against a sad world-blunder. That didn't just happen, because it came after good years of schooling. If schools can train kids to be better soldiers and sailors and battlefield mechanics and flyers and grease monkeys, maybe the same teachers can do something yet to stave off another catastrophe.

So I guess there's something basic about this teaching business after all, and we can't pass the buck much longer. What can you do to recruit better teachers? Go back to school and find out.

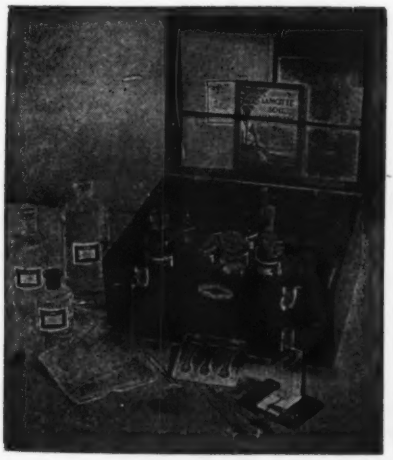
Time Proven LaMotte Soil Testing Apparatus

LaMotte Soil Testing Service is the direct result of 26 years of extensive cooperative research with agronomists and expert soil technologists to provide simplified soil testing methods. These methods are based on fundamentally sound chemical reactions adapted to the study of soils, and have proved to be invaluable aids in diagnosing deficiencies in plant food constituents. These methods are flexible and are capable of application to all types of soil with proper interpretation to compensate for any special soil conditions encountered.

Methods for the following are available in single units or in combination sets:

Ammonia Nitrogen	Iron
Nitrate Nitrogen	pH (acidity & alkalinity)
Nitrite Nitrogen	Manganeses
Available Potash	Magnesium
Available Phosphorus	Aluminum
Chlorides	Replaceable Calcium
Sulfates	

Tests for Organic Matter and Nutrient Solutions (hydroculture) furnished only as separate units.



LaMotte Combination Soil Testing Outfit

Standard model for pH, Nitrate, Phosphorus and Potash. Complete with instructions, $35.00 f.o.b. Towson, Maryland.

Illustrated literature will be sent upon request without obligation.

LaMotte Chemical Products Co.

Dept. BC Towson 4, Md.

Two months after he had run over a girl, a North Carolina motorist married her. If that sort of thing were made compulsory, there'd be less reckless driving.

* * *

There was a young chap named
McComb,
Who was cleaning his pants in his
home;
He used gasoline—
That's the last that was seen
Of McComb or his pants or his home.

* * *

Joe: "Do you know what one cigarette said to the other?"

Bob: "No, what?"

Joe: "I hope I don't get lit tonight and make an ash of myself."

* * *

In the ninth grade English class the teacher was discussing etiquette. When she finished, she asked Bobby how he would ask a girl to dance.

Bobby replied: "Come on, worm, let's wiggle!"

* * *

The tourist had stopped to change tires. "I suppose," he remarked to a native on-looker, "that in these isolated parts the necessities of life come pretty high."

"Yer right, stranger," the native replied gloomily, "an' it ain't worth drinkin' when ye git it."

"Pardon me, Mrs. Astor, but that never would have happened if you hadn't stepped between me and that spittoon."

* * *

Indisposed

"I hear you got a girl, Sam."

"Yes."

"What's her name?"

"Belle."

"Seen her lately?"

"No."

"What's the matter—had a fight with her?"

"No, I went to her house last night and there was a sign on the door, 'Bell out of order,' so I didn't go in."

* * *

"Pappa, vat iss a guardian?"

"A guardian, mine son, iss somevone vot takes your fodders place."

"Mine goodness, pappa, den I got five of dem."

* * *

DARNED SAFE

"Yer know, no matter where I keep me money, the missus allus finds it."

"My wife never finds mine. I keep it in the basket with me undarned socks."

* * *

"I wish we'd get a few shipwrecked sailors washed ashore," mused the cannibal chief. "What I need is a good dose of salts."

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

PACIFIC COAST BORAX COMPANY

NEW YORK CHICAGO LOS ANGELES

BORAX

for agriculture

20 Mule Team. Reg. U. S. Pat. Off.

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The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

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Asparagus (General)
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Better Corn (Midwest) and (Northeast)

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THE AMERICAN POTASH INSTITUTE

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The secret is *plankton algae!* All the fish in your pond depend, directly or indirectly, on plankton algae for food. They either eat plankton algae, or eat animal and insect life which exists on plankton algae, or eat other fish which eat plankton algae.

Plankton algae is a tiny water plant, so small it cannot be seen by the naked eye. But you can tell when plankton algae is present in sufficient quantities, as it gives the water a greenish or brownish color.

When your pond is well-managed and properly stocked with fish and the water supports an abundant growth of plankton algae, you always have good fishing luck. Like other plants, plankton algae requires plantfood for abundant growth. By adding fertilizer to your fish pond, you increase the growth of plankton algae and thus supply the food needed to grow more fish and bigger fish.

Virginia - Carolina Chemical Corporation has been a leader in the manufacture of better fish-pond fertilizers for many years. In growing crops or growing fish, make your own good luck: *Use* V-C *Fertilizers!*

FREE: *Write to the address below for your free copy of* "Good Luck for Fishermen."

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Make the good earth better!

THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

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THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

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IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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